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FACTORS OF ECONOMIC GEOGRAPHY

By

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PREFACE

Probably no other subject of the curriculum offers more divergence in definition and emphasis of subject matter than Commercial Geography. This is a natural consequence of the vastness of the subject and its varying applications to local requirements. Text books on this subject frequently present the phases with which the author is especially acquainted and which he feels should be stressed even to the exclusion of other important material. After many years of teaching Commercial Geography in the class room, the authors of this book have tried to assemble the essentials of the subject in such a way that the approach and emphasis can be adjusted to the needs of the individual teacher and his local requirements.

The subject is presented in short, independent units, grouped under three general approaches, the social-economic, the material, and the regional. This arrangement permits the teacher greater elasticity in choice of subject matter and more freedom in sequence of presentation. When time is limited, or less emphasis is desired, whole chapters may be omitted without serious detriment. Where greater emphasis is desired for any reason, correlated chapters and the special material at the end of each chapter may be used for supplementary work.

Text questions are scattered throughout the book at logical intervals. These are intended to aid the pupil in summarizing the information of the text. The problems, projects, topics, and class discussion material at the end of each chapter are designed for use when special emphasis on some particular phase is desirable.

The authors have been sparing of statistics and data that become quickly inaccurate and out of date, preferring to give general trends and causes rather than specific detail. Where exact information of a more permanent character has been necessary, it has been supplied. Throughout the book, more effort has been made to arrive at the underlying factors than to list a mass of statistical facts and figures, which, when desired, can easily be obtained from yearly source books such as the government publications and standard almanacs.

Attention has been given to the diction of the book with the aim of making it practical and readable for the pupil. A simple form has been used to catch and hold the interest, and thus to create a liking for the subject. No attempt, however, has been made to avoid the use of a vocabulary necessary to the subject.

Realizing that Commercial Geography has great possibilities within its scope for both cultural growth and vocational information, the authors have kept these constantly in mind in the organization and presentation of the material in this book.

ACKNOWLEDGMENTS

The authors are under a deep debt of gratitude for the many helps received from teachers and students who have shown an interest in the preparation of the manuscript. Many valuable suggestions were received from the teachers of the Dorchester High School for Girls, especially from Mr. William L. Anderson, the Head of the Commercial Department, under whose leadership and inspiration many of the basic ideas in the book were conceived. The co-operation of the teachers and pupils of the advanced typewriting classes in the Dorchester High School for Boys has been of great value in the typing of the manuscript. Thanks are given to them and to Dr. Frank E. Lakey, the Head of the Commercial Department, whose courtesy and interest made such co-operation possible. Acknowledgment is made of the valuable aid given by the faculty and pupils of the New York State College for Teachers.

Z. C. S.
G. M. Y.

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PART I—ECONOMIC FACTORS

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CHAPTER I

HISTORICAL FACTORS

Introduction. When we come to consider the different factors which affect commerce and industry, we find that nearly all historical events have influenced them somewhat. It is true, however, that some peoples and certain events have done much to promote commerce and industry, while others have hindered their progress. It is possible for us here just to touch upon the more important historical factors, leaving a fuller discussion to books on the history of commerce.

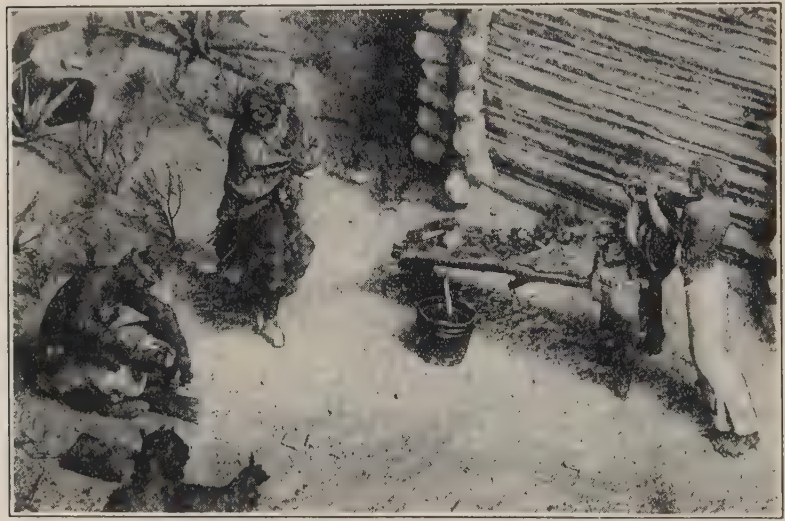
SECTION 1—ECONOMIC STAGES OF COMMERCE

The origin of commerce is unknown, but we do know that it existed long before any written records. For convenience, we may divide the rise and growth of commerce into five stages:

1. The Hunting and Fishing Stage
2. The Pastoral Stage
3. The Agricultural Stage
4. The Handicraft Stage
5. The Industrial Stage

It must be understood that these stages of commerce did not cover an exact number of years nor were they distinct from each other. They merged gradually one into another with no hard and fast division between them. Not every nation has passed through all of them in just this order, but most of them have followed this general course in their development from primitive days up to civilization. A few backward nations are still to be found in one of the earlier stages, but all the great civilized nations are now in the industrial stage.

The Hunting and Fishing Stage. The hunting stage can only exist in a country which has large areas of thinly settled land. Our ancestors of early times existed everywhere under these conditions, but today you would have to go to some place like the heart of Africa or the northern part of America to find them. The American Indian, before the coming of the white man, was an excellent example of this stage. His food consisted of the animals he killed in the chase, the fish in the streams, wild berries, and nuts. His clothing was made from the skins of wild beasts, and the utensils he used were of the crudest. Each tribe or family formed a separate economic group and there was little exchange between the different families and tribes—chiefly because they owned nothing worth trading, and manufactured nothing except what was absolutely necessary to satisfy their own simple wants.



(Keystone View Company, Inc., N. Y.)

FIG. 1. HUNTING STAGE, EARLY AMERICAN INDIANS
After the hunt, the meat is prepared and smoked for future use.

In the fishing stage, it was possible for people to exist in a more thickly settled area, as much land was not necessary.

Fishermen had to have houses, boats, nets, and fishing tools and equipment, so a small industry was created to supply these needs. Thus, gradually a division of labor arose, each man making what he could make best and trading that for needed articles made by some one else. Barter became common. After a time, fishermen began to push farther and farther out into the sea and so got in touch with other people living on other shores. This is the way navigation and commerce began. The Phoenicians are the best examples of this stage in early history, and the Eskimos, of modern times.

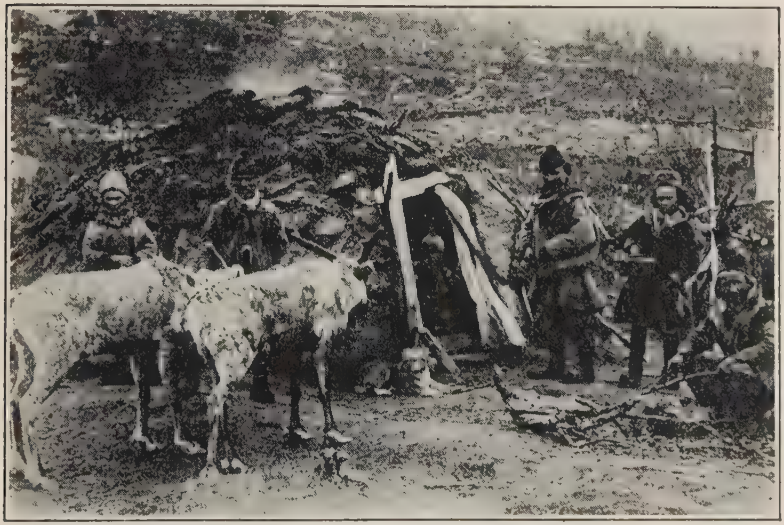


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FIG. 2. PASTORAL STAGE

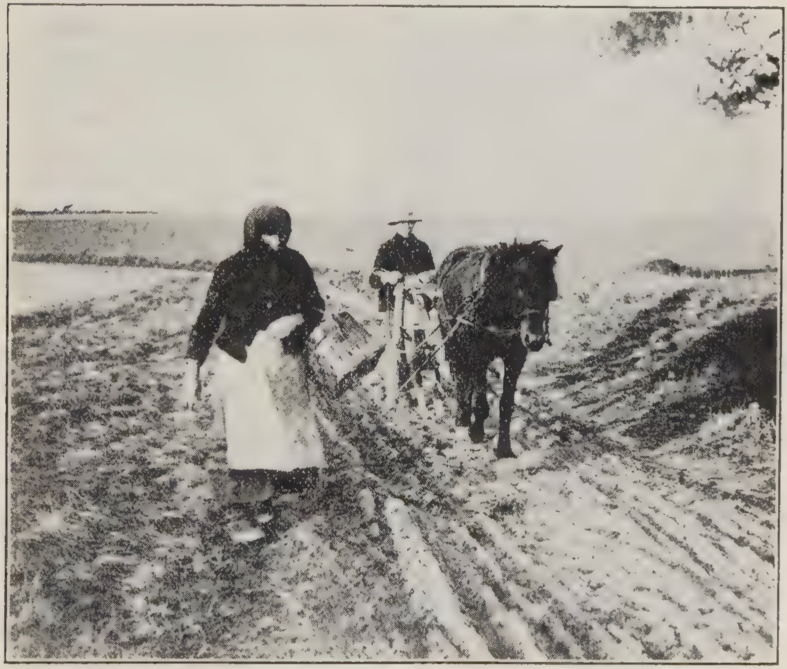
The wealth of Laplanders, whose country lies in the northern part of Sweden, is estimated by the size of their reindeer herds. The reindeer must wander for food and the Laps go with them, camping by the way in rude huts.

The Pastoral Stage. In the pastoral stage, primitive man tamed wild ancestors of our horses, cattle, sheep, etc., and made them useful instead of spending all his time hunting. Then he increased the size of his herds and gave up hunting. Instead, he wandered from place to place, seeking new pastures for his flocks and herds. Whole tribes became nomads without any settled home. To lead this sort of life, much grazing land, thinly settled, was necessary. The story of Abraham in the Old Testament gives us a good picture of this stage. As countries became more thickly populated, these nomads were obliged to fight to protect their pastures or to move on to other regions, as was illustrated by Lot separating from Abraham because there was not enough pasture for the herds of both. This explains in part many of the great migrations and invasions of history.

A certain amount of industry was necessary in connection with these herds and we find some barter in animals, hides, and wool. Later, people learned how to make cloth from wool and this became a very important article of primitive trade. As a result of all this, wealth began to be accumulated.

There are comparatively few peoples in this stage today but there are some regions fit for nothing but grazing, and in these places we still find people living the pastoral life. The Laplander, with his large herds of reindeer, and the Mongols, with their flocks of sheep and herds of cattle, have not yet progressed beyond it.

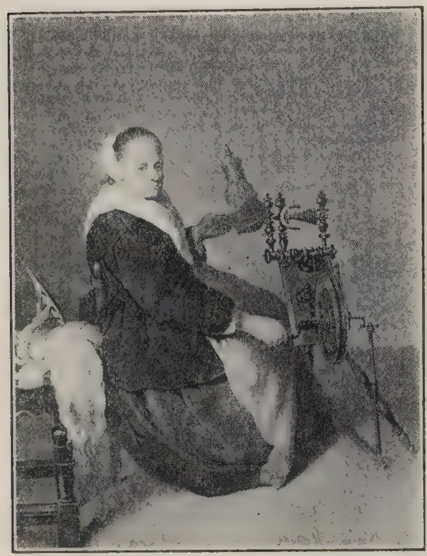
The Agricultural Stage. As men became more wealthy, they saw that it was much more desirable to have some fixed home instead of wandering from place to place as the nomads did. They began to set off certain areas of land for cultivation of crops, thus getting more variety of foods. Then they found that each family required less land, and villages were formed. At first, the land was cultivated in common by the village, but gradually private ownership of land became common. Protection against thieves and robbers made a strong government necessary, so nations were developed and patriotism arose. Industry grew, but commerce between the nations was limited to a few luxuries. A merchant class arose which carried on trade within the cities. For this, money became necessary and we see the beginning of metal money. Standards of weights and measures were necessary to carry on business and here we find their beginning. Gradually, mercantile customs and laws grew and became permanent. Great fairs, where merchants could meet and trade, were a characteristic feature of this stage. In the farming regions of Russia today, we find conditions much the same.



(Keystone View Company, Inc., N. Y.)

FIG. 3. AGRICULTURAL STAGE
Primitive agriculture as it is found in Russia.

The Handicraft Stage. As the agricultural communities became larger and larger, we find the population growing more dense, and a greater division of labor springing up. Certain men, for example, excelled in making cloth into garments and confined their labor to the tailoring trade, receiving returns for their work in other commodities. Thus sprang up a class of artisans who plied their various trades exclusively. As manufacturing by hand increased, the craftsmen formed unions and guilds for the governing of their trades, and later these guilds began to play an important part in history and in trade. As the population became more and more dense, villages expanded into cities which in turn grew to large bounds. As industry developed, commerce kept pace with it. Regions gradually began to exchange articles with each other. This resulted in a crude geographical division of labor. Foreign commerce became important and with it the merchants who conducted it. Waterways and ocean paths were the natural channels for transportation, and cities located favorably on them became of commercial importance. Money became necessary for trade exchange. Professional people grew more numerous. Gradually nations became stronger, wealthy, industrious, commercial, and more highly civilized. The great nations of the world remained in this stage until the discovery of steam and the beginning of the present industrial stage of today.


(Keystone View Company, Inc., N. Y.)
FIG. 4. HANDICRAFT STAGE
The spinner of long ago in her home factory.

The Industrial Stage. This stage was ushered in by what was called the Industrial Revolution. The invention of the steam engine, with the machinery which it runs, revolutionized the industrial world. The great strides of communication and transportation made it possible for commerce to keep up and to encourage the greatly increased industry. Hand trades almost disappeared and were largely replaced by the superior work of fast moving machines. The articles of commerce were formerly produced in the home or in small shops by hand. Now large factories turn them out by the hundreds and thousands. Industry has passed into the factory and machine stage. Electricity has advanced industry and commerce still more. In the industrial stage of the last one hundred years, the world business has advanced many times faster than in all of its previous history. The increased use of machinery during the past century has greatly enlarged man's power of production, and has improved his means of distribution. The farmer of today, with his farm machinery, can produce much more food supplies than could the farmer of a hundred years ago. Articles of commerce are now made by machinery more easily, more rapidly, more cheaply, and more uniform in quality than they were by hand labor. With this increase in per capita production, and better distribution facilities, have come better wages, higher standards of living, shorter hours, and less drudgery. At first the introduction of labor saving machines, which displaced many hand workers, was felt to be a calamity, but now it is recognized that labor-saving machinery benefits all, although it may work temporary injury to those who may lose their jobs because of its introduction.

The Economic Stages in the United States. When the white men landed on these shores, they found the Indians living in the hunting and fishing stage. As the pioneers pushed westward and found conditions favorable, the great cattle and sheep herds of the West gave rise to a life similar to the pastoral. These in turn were followed by the great agricultural strides of the corn and wheat belts. In the East, meanwhile, the handicraft stage was fast being superseded by the industrial stage. Even now, we find the trappers of our forest leading a hunting life; the cowboy, the pastoral life; the farmer, the agricultural life; and the wage earner of the East, the handicraft and industrial life. All these stages, however, are much more blended and touched by the greatness of advance in transportation and communication in the last one hundred years than they could have been before the advent of steam and electric discoveries. They are not therefore so distinct in stages as more isolated cases would be.

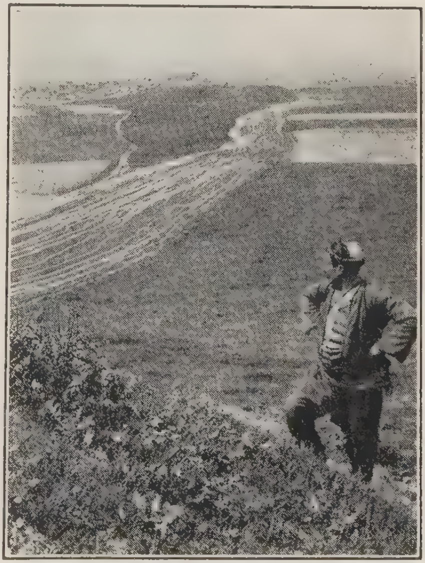
TEXT QUESTIONS

1. Name the five stages of economic development.
2. Why is it necessary to have thinly settled areas in the hunting stage?
3. Why is barter not common in the hunting stage?
4. Show how a simple division of labor results in the fishing stage.
5. Show how barter depends upon a division of labor.
6. Why is it natural for men in the fishing stage to become traders?
7. What does the word "pastoral" mean?
8. Tell why many of the world migrations and invasions occurred in the pastoral stage.
9. Why are many of the regions, in olden times suited to the pastoral stage, not so used now?
10. Why did private ownership of land arise?
11. Discuss the origin of government.
12. Show why money, merchants, standards of weights and measures, and mercantile customs and laws arose in the agricultural stage.
13. Discuss the growth of trade division of labor and geographical division of labor in the handicraft stage.
14. In what stage did professional men first appear?
15. Why did trade increase in the handicraft stage?
16. What sites favored the growth of commercial centers in early times?
17. Why did men remain so long in the handicraft stage?
18. What was the Industrial Revolution?
19. What has made it possible for commerce to keep pace with industry in the industrial stage?
20. Illustrate the five economic stages in the United States.
21. What has made these stages less distinct here?
22. Illustrate each of the stages in the world today.

SECTION 2—ANCIENT COMMERCE

We may group the history of commerce into three periods: the ancient or river period, the Mediterranean period, and the oceanic period. The great civilizations of ancient times naturally arose along the fertile river valleys where conditions were favorable to the support of large populations by agriculture, and where water transportation was at hand. So we find the leading regions of civilization and commerce, of the ancient times, in the river valleys. Among the first, we find Mesopotamia, the region between the Tigris and Euphrates Rivers, and Egypt, in the valley of the River Nile.

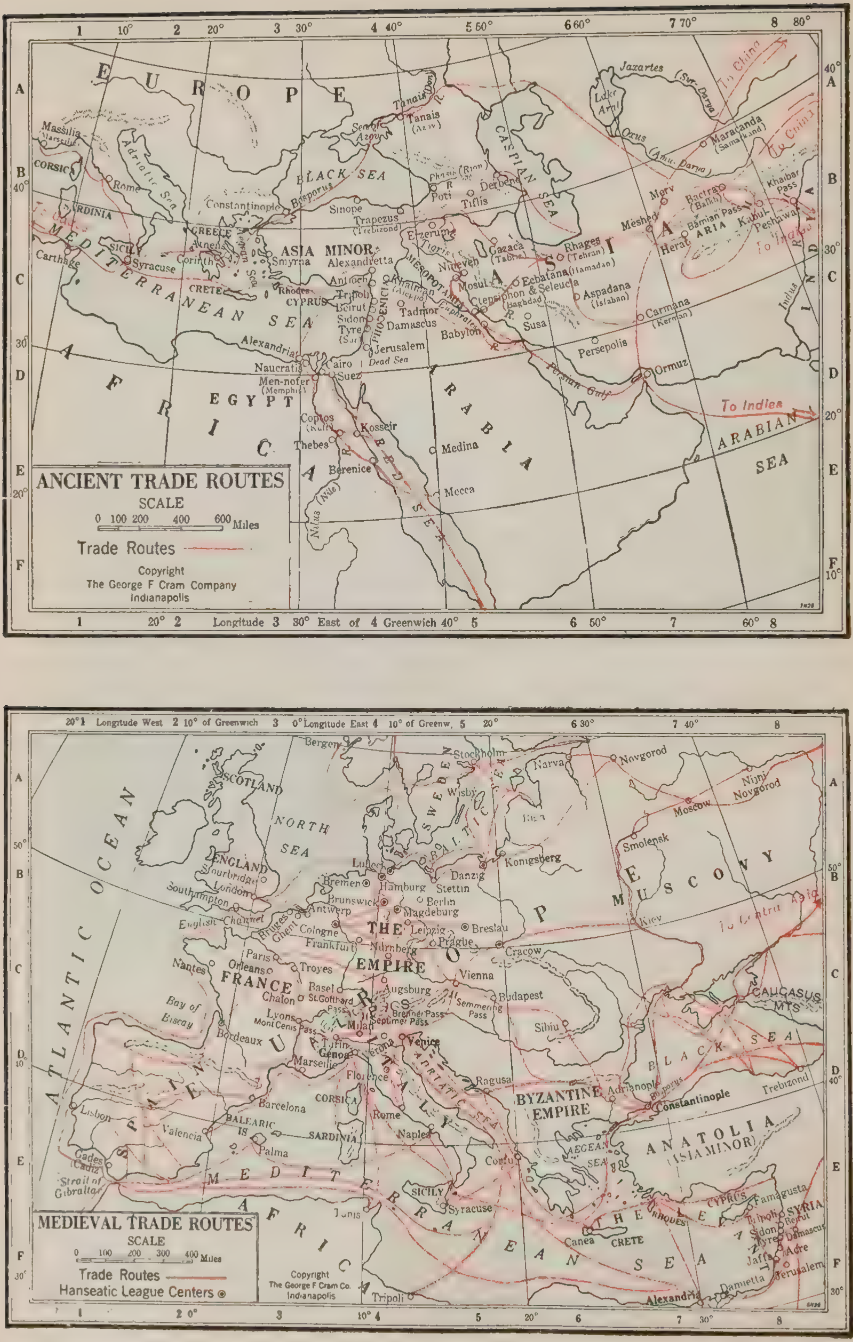
Mesopotamia. A highly developed civilization existed in Mesopotamia many years before Christ, and this region is sometimes called "the cradle of civilization." Its two rivers furnished the necessary water for irrigation and also transportation to the points where the caravan routes commenced. Its location, between the Far East and the Mediterranean countries, with India and the Persian Gulf on the south. made it a natural trade center.



(Underwood & Underwood, N. Y.)

FIG. 5. A SPOT NEAR ANCIENT NINEVEH IN MESOPOTAMIA

As trade with the surrounding people grew, specialized industry became necessary to supply the demands, and great cities like Nineveh and Babylon sprang up and later became famous for their textiles and pottery. Luxuries were added to their products and they became the centers of the commerce of that time. This commerce was carried


ANCIENT TRADE ROUTES
SCALE
0 100 200 400 600 Miles
Trade Routes
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The George F Cram Company
Indianapolis
Longitude 30° East of Greenwich
EUROPE
AFRICA
ASIA
ASIA MINOR
EGYPT
ARABIA
INDIA
MEDITERRANEAN SEA
BLACK SEA
CASPIAN SEA
RED SEA
Persian Gulf
ARABIAN SEA
Adriatic Sea
Aegean Sea
Dead Sea
Lake Aral
Jaxartes (Syr Darya)
Oxus (Amu Darya)
Tanais (Don) R.
Sea of Azov
Tigris R.
Euphrates R.
Nilus (Nile)
Indus
Massilia (Marseille)
CORSICA
SARDINIA
SICILY
Rome
Carthage
Syracuse
GREECE
Athens
Corinth
CRETE
Rhodes
CYPRUS
Constantinople
Bosporus
Smyrna
Sinope
Trapezus (Trebizond)
Tanais (Azov)
Phasis (Rion) R
Poti
Tiflis
Derbend
Erzerum
Alexandretta
Antioch
Tripoli
Beirut
Sidon
Tyre (Sur)
PHOENICIA
Damascus
Jerusalem
Khalman (Aleppo)
Tadmor
MESOPOTAMIA
Nineveh
Mosul
Babylon
Ctesiphon & Seleucia (Bagdad)
Gazaca (Tabriz)
Ecbatana (Hamadan)
Rhages (Tehran)
Aspadana (Isfahan)
Susa
Persepolis
Carmana (Kerman)
Ormuz
Meshed
Merv
Herat
ARIA
Bactra (Balkh)
Bamian Pass
Kabul
Khaibar Pass
Peshawar
Maracanda (Samarkand)
To China
To India
To Indies
Alexandria
Naucratis
Cairo
Suez
Men-nofer (Memphis)
Coptos (Kuft)
Thebes
Kosseir
Berenice
Medina
Mecca
MEDIEVAL TRADE ROUTES
SCALE
0 100 200 300 400 Miles
Trade Routes
Hanseatic League Centers ⊙
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The George F Cram Co.
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Longitude West 10° of Greenwich
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ATLANTIC OCEAN
NORTH SEA
BALTIC SEA
Bay of Biscay
English Channel
Strait of Gibraltar
MEDITERRANEAN SEA
ADRIATIC SEA
AEGEAN SEA
BLACK SEA
SCOTLAND
ENGLAND
Stourbridge
London
Southampton
SWEDEN
Bergen
Stockholm
Wisby
Narva
Novgorod
Nijni Novgorod
Moscow
Smolensk
Riga
Konigsberg
Danzig
Lubeck
Bremen
Hamburg
Stettin
Berlin
Brunswick
Magdeburg
Antwerp
Bruges
Ghent
Cologne
Frankfurt
Leipzig
Breslau
Prague
Nurnberg
Cracow
Kiev
MUSCOVY
EUROPE
THE EMPIRE
To Central Asia
FRANCE
Paris
Orleans
Troyes
Nantes
Basel
Chalon
St.Gotthard Pass
Augsburg
Vienna
Brenner Pass
Septimer Pass
Semmering Pass
Budapest
Sibiu
Lyons
Mont Cenis Pass
Milan
Turin
Genoa
Verona
Venice
Bordeaux
Marseille
Florence
ITALY
Ragusa
SPAIN
Lisbon
Valencia
Barcelona
BALEARIC IS
Palma
Cadiz
CORSICA
SARDINIA
Rome
Naples
SICILY
Syracuse
Corfu
Tunis
Tripoli
AFRICA
BYZANTINE EMPIRE
Adrianople
Bosporus
Constantinople
Trebizond
CAUCASUS MTS
ANATOLIA (ASIA MINOR)
RHODES
CRETE
Canea
CYPRUS
Famagusta
SYRIA
Tripoli
Beirut
Sidon
Tyre
Damascus
Acre
Jaffa
Jerusalem
Damietta
Alexandria

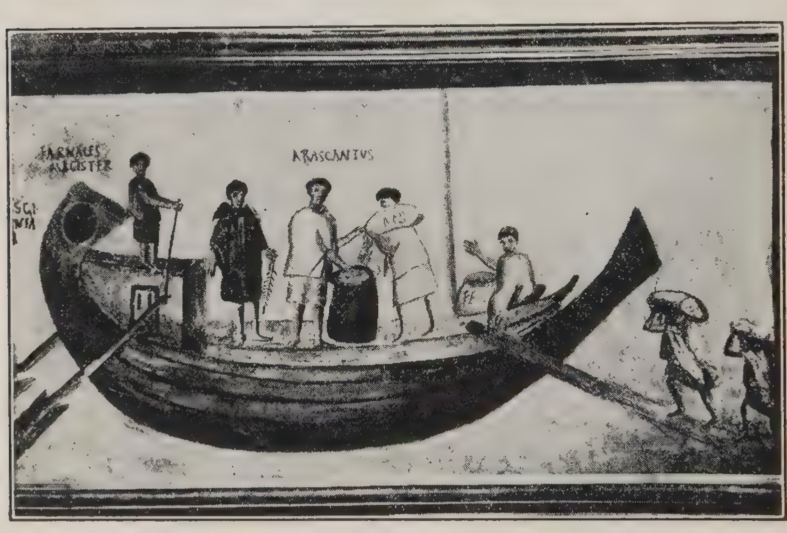
FIG. 6

on to the west by the Phoenicians, and to the south and east by the citizens of the country. The trade routes established in this region in ancient times were followed by caravans for hundreds of years, and today the railways are using them. In later times, the closing of these routes by the Turks led to the discovery of all-water routes to India, and, with the increased importance of ocean navigation, the land routes fell into disuse or were supplemented by the railways. Once powerful cities sank into decay and disappeared. Nevertheless, the effect of this ancient commerce was felt for hundreds of years and we still have today many business customs and laws which originated in this region.

Ancient Egypt. A great civilization flourished in the Nile River Valley hundreds of years before Christ. The Nile, by its periodic overflow, made the soil along its course very fertile. On each side rose mountains, or stretched deserts, which kept it isolated from other regions, thus providing protection from invasions. While the Egyptians developed many of the arts and sciences, and carried on a considerable domestic commerce, we find that their foreign commerce was comparatively small. The isolation of their country coupled with racial exclusiveness discouraged foreign commerce which was dominated and carried on by other peoples, notably the Phoenicians.

The Phoenicians. The Phoenicians held a unique position in the history of commerce. They settled in a narrow region bounded on the east by the Lebanon Mountains and on the west by the Mediterranean Sea. The cedars of Lebanon furnished wood for the ships, and the coast yielded a mollusk from which they extracted a purple dye, used exclusively by nobility in olden time. This naturally led the Phoenicians into a seafaring life and soon they became the mariners and traders of the Mediterranean Sea, ushering in the Mediterranean stage of commerce. Tyre and Sidon were their principal cities, and in these cities industries sprang up to supply the demands of the merchants who were trading all over the Mediterranean Sea and as far away as England.

They increased the use of metals, invented the alphabet, adapted mathematics to trade usage, enlarged the map of the then known world by pushing out into western territory, and planted colonies at strategic points for trade. Later, when the power of the Phoenicians declined, Carthage, the chief of these colonies, assumed the lead in commerce and held it until destroyed by Rome.



(Keystone View Company, Inc., N. Y.)

FIG. 7. BOAT OF ANCIENT TIMES

In contrast to our great freight steamers is this painting of an early Roman boat.

The Greeks. Greece is a barren country not favorable to agriculture, but it abounds in good harbors. It was natural therefore for the Greeks to take to the sea early in their history. They soon surpassed their teachers in commerce, the Phoenicians, and gradually became their successors in the commerce of the Mediterranean Sea. Greek colonies were established in Asia Minor and then spread westward even as far as the site of the city of Marseilles.

About 330 B.C., Alexander the Great spread the power and prestige of the Greeks everywhere; Greek became the language of trade, and Greek money, the medium of exchange. Tyre and Sidon were conquered. A new city, destined to become very important in commerce, was founded near the mouth of the Nile and called Alexandria. Other cities took on importance in the commercial world. Rhodes gave us the first code of maritime laws which governed navigators for centuries. Antioch, at the starting point of a trade route to Mesopotamia, grew in power. The overthrow of Carthage and its consequent total destruction by Rome (146 B.C.) gave the Greeks control of the commerce of the western Mediterranean Sea and from then on the Greeks were dominant traders for many years.

The Greeks left their mark on commerce by the establishment of colonies, by the introduction of metallic money, by giving an almost universal language to trade, by increased knowledge of navigation and the codification of maritime law, and by the creation of a demand for the interchange of products, principally luxuries, between the various countries.

Rome. Rome, as a nation, was not commercial but rather political. Her men looked down on commerce as work for foreigners. At the height of her power, she had a large trade as a consumer. She produced little and paid for her importations with money secured as revenues from her conquests. She made transportation easier by her magnificent roads which were built for military purposes.

The Pax Romana was an almost universal world peace which was made possible by Rome's dominion over practically all the then known world. Her laws and government favored commerce by bringing order out of a confused mass of varying customs. In financial matters, she exercised an important influence by standardizing the rates of exchange and by accumulating large amounts of capital. She was for some time the financial center of the world.

TEXT QUESTIONS

1. Into what three periods may we group the history of commerce? In which period are we now?
2. Why did early civilizations arise along river banks?
3. What rivers played an important part in the growth of ancient Mesopotamia? How did they help?
4. Show how the location of Mesopotamia early caused it to become a natural trade center.
5. Name two of its famous cities and tell why they were famous.
6. Why did Mesopotamia lose its leadership in commerce? Explain.
7. What contributions did ancient Mesopotamia make to commerce in general?
8. Give two reasons why ancient Egypt early became powerful.
9. Were the Egyptians famous for their commercial activity? Explain.
10. What contributions did the Egyptians make to commerce?
11. What race opened the Mediterranean stage of commerce?
12. Explain the rise of the Phoenicians as great traders.
13. Name their two leading cities and one of their colonies.
14. List the contributions of the Phoenicians to commerce.
15. Why was it natural for the Greeks to become sailors?
16. How did Greek colonization affect commerce?
17. Discuss the effect of Alexander the Great on commerce.
18. What city founded by him later became an important commercial center? Locate it on the map.
19. How did the destruction of Carthage affect the commerce of the Greeks?
20. Name and locate some ancient Greek cities that were commercial centers. For what were they famous?
21. Make a list of all the contributions of the Greeks to commerce.
22. How did Rome aid commerce in ancient times? Explain.

SECTION 3—MEDIEVAL COMMERCE

After the downfall of the Roman Empire and its division into the Eastern and Western Empires, there was a period of time, from 500 A. D. until 1100 A. D., which is called the Dark Ages in the history of western Europe. During this time, commerce suffered a serious setback in this region. Trade routes fell into bad conditions and transportation became difficult and dangerous. The numerous petty feudal rulers demanded frequent tolls on the rivers and roads throughout their domains. For instance, a merchant traveling up the river Loire from Nantes to Orleans, a distance comparable to that from New York to Albany, was required to pay over 50 different tolls on his goods. Piracy was winked at by the barons and many younger sons of nobility led robber bands who preyed upon travelers and merchants.

The Christian Church was "the bridge of communication" between civilization and barbarism. She helped keep the roads open, afforded hospitality to the traveler in her monasteries, kept alight the beacon of education, and by "the Peace of God" afforded somewhat of a protection. Gradually her influence grew stronger, and western Europe began to emerge from this dark period. Feudal lords were interested in building up local commerce and industry, but their constant warfare with each other discouraged both and retarded progress greatly.

Medieval Fairs. Gradually, merchants began to get together at certain places at certain times to exchange articles, and to buy and sell. These occasions gave rise to fairs which were held during religious feasts. Merchants from everywhere came together and were afforded much more protection than they otherwise would have had. The fairs were organized and conducted under special laws.

Courts were set up where disputes could be adjusted. This gave rise to a set of laws known as the "Law merchant" and from this mass of laws came most of the business laws of today. These were called "piedpoudre" courts because it was said that the cases were decided with such dispatch that the dust did not have time to fall from the involved merchants' feet.

The trade at these fairs was of a wholesale nature, the retail business being carried on in the markets which were held weekly or monthly in districts. Almost all the retail business was conducted on market days which were set aside for the purpose. From the custom of holding these large fairs annually arose several famous fairs which are continued even to this day. The various so called "world fairs" and "expositions" are a survival of this custom. Certain systems of weights and measures became common and the systems used at the great fairs at Troyes became the basis of one of our modern systems.

The Levant. The lands of the eastern Mediterranean were called the Levant. While western Europe was passing through the Dark Ages, the Levant advanced in commerce and prosperity. Alexandria and Constantinople were the leading centers of commerce, the latter gradually assuming the lead.

The introduction of silk culture from the East supplied much raw silk which, supplemented by the silk brought over the caravan routes, soon made these cities famous for their beautiful textiles. All the Oriental products which reached the west passed through the Levant; thus, commerce was in the hands of the Greeks and their successors. Gradually, industry began to be developed in western Europe. All this eastern commerce was important because it kept open the trade routes to the Far East and made possible the exchange of products between the Far East and the West.

The Rise of Italian Cities. From the year 1100, we see western Europe emerging from her backwardness. The Italian cities of Venice and Genoa became rivals of, and then successors to, Constantinople. The Crusades greatly stimulated the growth of these cities as mercantile powers. The Crusades were wars waged to recover the Holy Land from the hands of the Mohammedans and were fought by the

Christians of western Europe. Most of the armed forces went to the East by the way of the Italian ports. This encouraged shipping and also commerce in articles necessary for the equipping of these expeditions.

The men who returned from the Crusades had acquired many new tastes and many new luxuries in the Levant. This encouraged a steadily growing demand for the products of the East, which was supplied by the commerce of the Levant, through Constantinople and Alexandria. The trade power thus passed out of the hands of the Levant westward to Italy.

(Keystone View Company, Inc., N. Y.)

FIG. 8. VENICE

Venice was one of the leading commercial centers of Europe.

Venice in time became the leading commercial city of the Mediterranean, her whole commerce being based on the exchange of products between the West, the East, and the South. From Venice, trade routes ran in all directions and large cities sprang up along these routes all over Europe. Thus we find the products of western and northern Europe flowing eastward through Venice and the products of the Orient coming in the opposite direction. Modern business methods arose. The origin of the systems of bookkeeping is credited to the Italian cities.

The Hanseatic League. In northern Europe, some of the larger municipalities combined into leagues for mutual self-protection. The most important one was the Hanseatic League which, at the top of its power, had 90 cities in its membership. Agencies, called factories, were established. The League encouraged manufacturing, established schools in which to train its employees, undermined the feudal system, protected its members against piracy and robbery, and encouraged commerce in every way. As conditions became more settled in Europe, it gradually lost its power and disappeared, but not before it had exercised a powerful influence. Most of the commerce of this time went through Venice until the time of the great discoveries when the well trained seamen of the Hanseatic League took over much of the trade to India.

Navigation. Up to 1200 or thereabouts, the vessels used in transporting merchandise had been designed for comparatively safe navigation in the enclosed Mediterranean Sea. Without keels they could not tack against an unfavorable wind but depended on banks of oars pulled by slaves to keep them on their course, and also for motive power in case the wind failed.

Meanwhile the Northmen invented the keel which permitted sailing against the wind, and, about 1400, the compass was invented. Great progress had been made in the knowledge of navigation and already some commerce was being carried along the Atlantic Coast of Europe. The vessels of that time were small and poorly designed for ocean traffic, but a start had been made towards the development of an ocean-going boat which would not be wholly at the mercy of the wind.

The Closing of the Trade Routes to the East. While Venice and Genoa were at the pinnacle of their prosperity, a race called the Turkomans or Turks over-ran the eastern

Mediterranean countries. They became fanatical followers of Mohammed. Slowly but surely they closed the great trade routes to India and to the Far East and, in their zeal to hurt the Christians, they cut off the commerce which was flowing through the countries they had conquered.

(Keystone View Company, Inc., N. Y.)

FIG. 9. THE NORSEMEN

The Norsemen invented the keel which made it possible to sail against the wind.

Constantinople was vanquished and Genoa was unable to keep up her flourishing trade. Then Alexandria and Egypt were closed to the Venetians. Prices of eastern products rose and became prohibitive. The cities on all the trade routes throughout Europe lost the commerce upon which they depended. Fabulous profits became possible to anyone finding an all-sea route to India and the Orient, and so men began to think about this possibility.

The closing of the great overland trade routes to India and the Orient by the Turks is one of the great historical events which left a lasting impression upon commerce. It forced the great discoveries which made the tremendous commerce of today possible.

(Keystone View Company, Inc., N. Y.)

FIG. 10. SHIPS OF EARLY AMERICAN COMMERCE

The Great Discoveries. While the commercial supremacy of the Italian cities and the cities on their trade routes was being threatened with extinction by the closing of the caravan routes to the Orient, other nations began to be interested in the finding of an all-water route to India. Portugal organized an expedition to sail around Africa, which reached the Cape of Good Hope and then returned. Later, in 1497, Vasco da Gama, under the Portuguese flag, actually did reach India by this route, and returned with his ship laden with the much prized products of India.

Meanwhile, Columbus sailing westward in 1492, under the financing of Spain, had discovered the Americas in his search for an all-water route to India. These two discoveries had a tremendous effect in that they caused a right-about-face of the commerce of the world and ushered in the change from the Mediterranean stage to the oceanic stage of commerce.

Early Atlantic Commerce. Up to the time of these great discoveries, there had been but little commerce on the Atlantic ocean and that only along the coasts of western Europe. Now the great coast countries came into importance. Portugal, Spain, Holland, France, and England became dominant factors in commerce. Venice and her dependent cities left the stage and new cities arose along the Atlantic coasts wherever there were good harbors. The Americas demanded colonization, and an immense trade sprang up which dwarfed the former trade of the Mediterranean. The Orient and its products were accessible by water. The character and volume of commerce changed rapidly. Articles which previously were luxuries became necessities. Commerce, at last released from the narrow confines of the Mediterranean, grew in leaps and bounds.

Modern Commerce. In the following pages of this book, we shall study the commerce of today. We shall find that this commerce has grown to be not only one of luxuries, but also in large part of necessities. We shall see how the invention of steam and electricity, with their attendant machinery, revolutionized industry and commerce. We shall see a commerce encircling the entire globe and the products of commerce and industry coming from everywhere. And finally, we shall see that in the last century inventions have made the living conditions of the common people superior to that of kings of former years.

TEXT QUESTIONS

1. Discuss briefly commerce during the Dark Ages.
2. Show how the Church helped greatly at this time.
3. Why were Medieval Fairs necessary? Give their effects on commerce.
4. What two cities in the Levant prospered during this time? Why?
5. Explain the rise of the Italian cities. What two cities gained the lead? Why?
6. Discuss the effect on commerce of the rise of the Italian cities.
7. Why did the Hanseatic League arise? Give its effects on commerce.
8. Discuss the improvement in navigation about this time.
9. Who closed the trade routes to the Far East? Why?
10. Discuss the effect on commerce of this closing of the trade routes.
11. Explain the interest in finding an all-water route to the East.
12. Why did not the Italian cities show more interest in this?
13. What discoveries turned the tide of commerce from the Mediterranean to the Atlantic? Discuss.
14. Discuss the influence of the great inventions on world commerce.
15. Show how commerce has passed from trade in luxuries alone to one of necessities also, and has raised the status of the common people.

PROBLEMS AND PROJECTS

1. Name a recent historical event which has increased commerce. One that has decreased commerce. Prove your answers.
2. Which economic stage would you prefer to live in? Why?
3. Why did not the American Indian advance beyond the hunting and fishing stage?

4. Why have the Mongols remained in the pastoral stage so long?
5. Trace the history of the Hebrews through the economic stages.
6. Show that agriculture is the basis of commerce and industry.
7. Has the change from the handicraft stage to the industrial stage been beneficial to labor? Prove your answer.
8. Trace the origin and growth of division of labor. Of geographical division of production.
9. Why is not Mesopotamia a leading commercial region now?
10. Why did Egypt lose her leadership?
11. Over-emphasis on money and material gain eventually undermined and destroyed the Phoenicians. Illustrate how this always affects the individual and the nation.
12. Rome maintained almost universal peace by might. Have we ever approached universal peace since her downfall? Can we secure it by any other means than force?
13. Which has left a more lasting impression, the cultural or commercial supremacy of Greece? Which memory would you prefer to leave behind you?
14. History shows a cycle of high civilization followed by a relapse into darker periods. Will our present civilization be followed by such a dark period? How can it be prevented? Will it be prevented?
15. Explain the apathy of the Italian cities towards the finding of an all-water route to India. The interest of Spain and Portugal.
16. Show how the Hanseatic League prepared for ocean navigation.
17. How did the religious fanaticism of the Turks, resulting in the closing of the trade routes to the East, react on their own welfare?
18. List the effects of the discovery of America on commerce.

19. Make a list of the leading inventions that make our present industrial stage possible. Which, in your opinion, is the most important?
20. Compare the present economic status of the common people with that of ancient times. Of the medieval times. Of the handicraft stage. Of one hundred years ago. Of fifty years ago.
21. Show how increased and improved facilities of production and distribution have made possible the increased population of the world today.
22. Compare the present productive ability of the individual with that of one hundred years ago. Explain the decrease in number of hours of work.
23. Show how commerce has changed from luxuries to necessities. What articles are necessities to you that were luxuries one hundred years ago?
24. In your opinion, what historical event has influenced commerce the most? Give reasons for your answer.

TOPICS

1. Commercial customs and laws we inherit from ancient times.
2. The social status of the merchant, past and present.
3. The advance of commerce and industry in the past one hundred years.
4. Some effects of commerce and industry on history.

FOR CLASS DISCUSSION

1. The world is growing better.
2. Commerce increases peace rather than war.
3. Our commercial and industrial expansion threatens our ultimate welfare as a nation.
4. Each nation should be self-sufficient in the production of necessities.
5. Material prosperity lessens cultural growth.
6. Our present civilization will fall for the same reason that former ones have fallen—too much prosperity.

CHAPTER II

SOCIAL FACTORS

Introduction. In this chapter we shall study another group of causal factors of commerce, called social factors. By social factors is meant civilization, race, religion, language, government, and business organization. These social factors have a large influence on commerce and industry because they determine the quality and quantity of the wants of a people, and also their productive ability.

Civilization. In regard to their degree of civilization, people may be classified as savage, semi-civilized, and civilized. The tribes of the interior of Africa are savage; the American Indian of history might be classified as semi-civilized; and the American of today, as civilized.

The savage has few wants and these are easily satisfied. He is content with his condition, and not wanting much, has no ambition to work and produce. One of the problems of commerce is to create in the heart of the savage a desire for more things so he will work and contribute to trade in order to secure satisfaction for these increased wants. Beyond a few trinkets to satisfy his vanity and "fire water" with which to debauch himself, he has little or no interest in trade. As man's wants increase, his degree of civilization rises.

Among the semi-civilized people, we find the beginnings of trade, principally as barter, whereby the surplus products of one tribe are exchanged for the surplus of others. The highly civilized man has many wants, some of which he can never satisfy. He has learned to co-operate, to produce, to manufacture, and to trade his surplus for money with which he can secure comfort and progress by purchase of articles from other sources. All this promotes a necessary commerce, and the civilization to which a people has risen may be measured somewhat by their commerce. While commerce is a factor in making civilization, it is also true that civilization promotes and creates commerce.

Language. The lack of a universal language has always been a serious handicap to commerce. Attempts have been made to create a common language like Esperanto, but without success. It seems evident that only by the dominance of some existing language over others will we arrive at a common business language. English, by its universality and elasticity, is fast becoming the language of world commerce and is supplanting French as the language of diplomacy.

There are several combination languages like Lingua Franca, which is a mixture of French, Italian, and Arabic, and is used somewhat among the traders around the Mediterranean Sea. Pidgin English is another combination, being a mixture of English and Chinese, which is used in the ports of the western Pacific Ocean. Improved means of communication, printing, education, and the radio have helped the different people to understand each other better.

Race. For our purpose, men may be classified into three great races, each one being subject to indefinite sub-division. These races are the Indo-European or white race, the Mongolian or yellow race, and the African or black race.

The Indo-European race lives chiefly in the temperate zone. It is composed, in large part, of European people and their colonies. Although only about one-third of the population of the world belongs to this race, it controls nine-tenths of the world. This is due to the fact that it has all the characteristics which make for great civilizations and that it has dominated the commerce of the world throughout history.

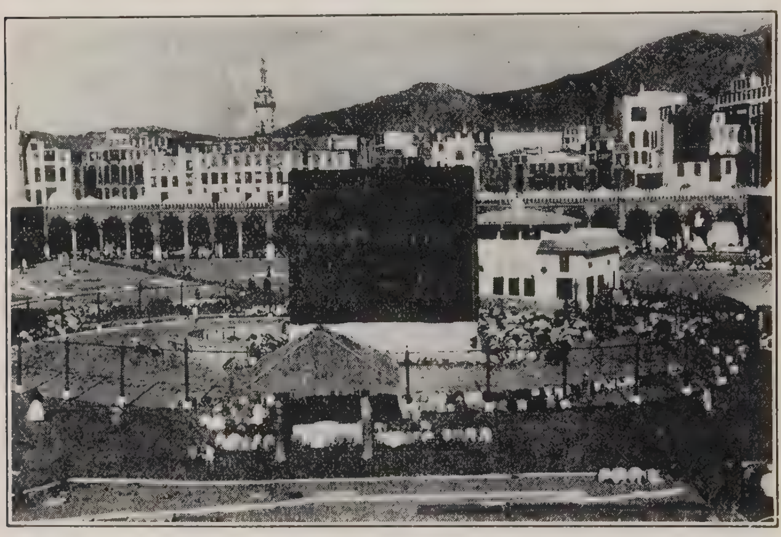
The Mongolian race ranks next to the white race in numbers and importance in commerce. Due to isolation and other factors, the commercial progress of the yellow race has been retarded until comparatively recent times. The great discoveries and the expansion of the world trade made possible by improved ocean navigation, have brought the Mongolian people into closer touch with the white race. By adoption of Occidental methods, the Mongolians have advanced very rapidly in recent years. Japan, in the last one hundred years, has developed greatly and is now leading the countries of the Orient in commerce. China is awakening to her possibilities in world commerce. So great has been the advance of the yellow race that fear is expressed by some that it will eventually dominate the world.

The African has never had a serious part in commerce. The majority of this race inhabit the torrid zone and have the characteristics which result from a tropical life. As a race, they never have been commercial.

Population. The density of population is the number of people per square mile. This density of population has a tremendous effect on the commerce of a region. In thinly settled countries certain activities, such as grazing herds, hunting, lumbering, etc., are possible which would be impossible in a more densely populated place. As a region becomes more thickly populated, these industries give way to agriculture which grows more and more intensive as numbers increase. Finally villages and towns and then cities take the place of the farms, and manufacturing and industry become necessary to support the increasing population. Specialization takes place and products of the factory are exchanged for food stuffs from the farms. More commerce is created and becomes necessary.

The large populations of our cities could not exist without commerce. Density of population makes for increased commerce. With the increase of population also comes the demand for more production. The rapid increase of population in the last one hundred years has been possible only because of the increased production of the necessities of life and the improved means of distribution. If the population of the world continues to increase rapidly, the problem of supplying food will soon become a serious one, unless science and commerce keep pace with the demands.

Density of population also has a tendency to bring about emigration. When conditions in one locality become economically unsatisfactory, some of the population moves on to a more favorable location. This is particularly true of the white race and has led to the colonization of practically all the desirable open spaces of the temperate zone. European emigration has spread the white race over the Americas and Australia, and has greatly increased the commerce of the world thereby. Ratzel says, "The increase of population means not only density but stability, and that which is stable is always conducive to culture." So the density of population increases commerce by increasing stability and culture, and hence develops civilization.



(Photograph by Ewing Galloway, N. Y.)

FIG. 11. MECCA
A Mohammedan shrine to which thousands travel yearly.

Religion. The religion of a people affects their commerce to some degree. The Jew eats no pork, the Brahman eats no beef, the Mohammedan is forbidden pork and alcoholic liquors, and the Catholic denies himself meat on certain days. The fish industry of Puritan New England was greatly stimulated by the demand for salt codfish in Catholic countries. We find also that religious festivals and holidays hinder or encourage commerce. Thus Christmas and Easter increase commerce greatly, while religious pilgrimages create demands which commerce supplies. It is said that every day in the month of April is a religious holiday somewhere in the world in some religion. This adds greatly to the work of international bankers.

The caste system in India with its iron-clad rules slows up commerce and industry. In Thibet, every third man becomes a monk, thereby reducing the production of the people. Confucianism, with its opposition to all things new, has held China back and encouraged the overpopulation of that country. Mohammedanism creates in its followers an attitude of mind which is not favorable to world commerce. On the other hand, the religions of the white race have helped commercial expansion. Their followers have been among the first in discoveries and colonization. Their missionaries have oftentimes preceded their merchants. Their high standards and teachings have made big business possible among their followers.

Government. With civilization and commerce come stability and private ownership. Before a large commerce is possible in a region, there must be established a firm and strong government for the protection of the traders and people. The nations which lead in commerce are favored by such a government and where we find a feeble and weak government, there we find little commerce.

It matters not so much what form the government may take, whether a monarchy or a republic; it is the character of the government that affects commerce. The courts must be impartial, real protection must be afforded, honesty and justice must prevail or commerce will seek other places. Where graft and dishonesty prevail, trade languishes. Men will not work and produce if they are fearful that their rulers will rob them of the results. Russian peasants showed little interest in agriculture as long as the government seized their crops. Not only should a government be strong and able to protect, but it also must help commerce directly by its activities.

TEXT QUESTIONS

1. Name the important social factors that affect commerce.
2. In what way do the social factors influence commerce?
3. Name and illustrate three degrees of civilization.
4. Prove that as man's wants increase so does his degree of civilization.
5. How is commerce conducted among semi-civilized men?
6. How does civilized man satisfy many of his wants?
7. Why do we have so many different languages?
8. What language will probably become that of commerce? Why?
9. Name two combination languages and tell where they are spoken.
10. What agencies are helping people to understand each other better?
11. Name three divisions of men as to race.
12. Where is found most of the Caucasian race? Why?
13. Why is it the dominant race?
14. What has retarded the progress of the Mongolian race?
15. Why has the African race never led in commerce?
16. Discuss the effect of density of population on commerce.
17. How has the great growth in population been dependent on commerce?
18. What has been the reason for emigration to colonies? Explain.
19. Show how the great religions affect commerce.
20. Discuss "The kind of government is less important to commerce than the character of it."

PROBLEMS AND PROJECTS

1. Show how the coming of the white man has frequently resulted in the ruin of native races. Does this justify civilization?
2. Explain why universal language and standards are so difficult to establish.

3. Explain the dominance of the white race over the majority of the world's surface.
4. Give briefly the view point of the following persons in regard to the restriction of immigration into this country: (1) a contractor, (2) an unskilled laborer, (3) a tax payer, (4) a professional man, (5) a patriot, (6) a recent immigrant.
5. Discuss the influence of religion in the settlement of America.
6. Illustrate the effects of poor and good government on commerce.
7. In what ways have the Orientals profited by contact with the white race? In what ways have they lost?
8. Does the use of Niagara Falls show the superiority of the white man over the Indian? Give a reason for your answer.
9. Why do people prefer to live in cities? In the country?

TOPICS

1. Food supply and increased population.
2. The good points in Oriental religions.
3. What is civilization?
4. The rise and fall of previous civilizations.
5. Racial characteristics.

FOR CLASS DISCUSSION

1. Our greatest men have come from densely populated areas.
2. The world faces a grave danger of over-population.
3. War and pestilences are necessary to keep population down.
4. The savage with few wants and desires, and those easily satisfied, is better off than the highly civilized man, with many wants and desires, many of which can never be satisfied.
5. The English language is best fitted to become the universal one.

CHAPTER III

PHYSICAL FACTORS

SECTION I—CLIMATE

Importance of Climate. The most important physical factor which affects commerce and industry is climate. Climate is the temperature and humidity of the air. The fact that some regions of the world contribute much to trade, while others give but little, is due chiefly to the climate of the different regions, which determines what plants and animals can thrive in a region, and whether the inhabitants are lazy and indolent or industrious and energetic. From the plants and animals come the commercial raw materials of a region, and upon its people depend the use or neglect of these products.

Effect of the Tropics. The tropics furnish raw materials in abundance but the natives have been unable to change them to any great extent into articles of value to others. Nature's very abundance in the tropics produces men of little ambition, with no foresight, no desire to work, and without energy. Food, clothing, and shelter are secured with little effort. Wants are few and easily satisfied. Hard work and foresight are unnecessary, and an easy going, carefree, lazy life results. When white men from the temperate zones, with all their natural ambition and energy, go into the tropics, they find that they are unable to do hard physical labor because of the steady heat to which they are unaccustomed. Natives will not work and white men can not, so the tremendous natural resources of the tropics have hardly been touched commercially.

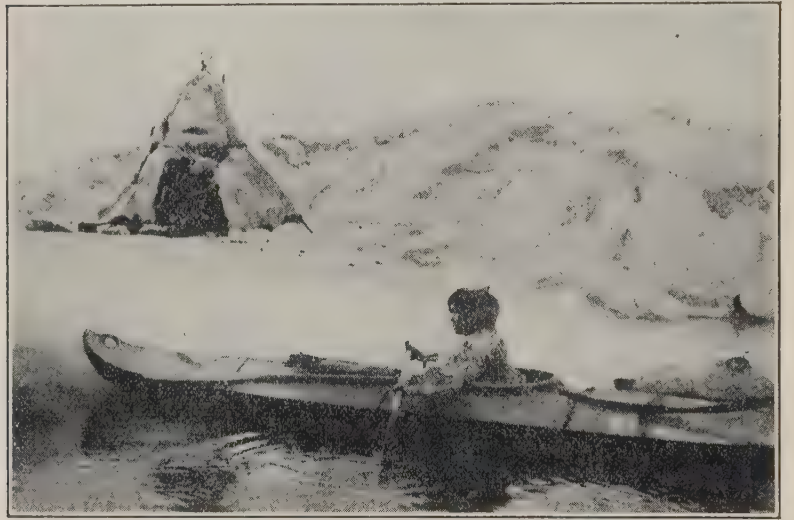
Only where native populations have been induced to work under the organization and intelligence of men from the temperate zones has any development of the tropics been accomplished. The great rubber industry is a very good example of this fact. Native races used rubber only to play ball with until the white man found commercial uses for it and induced the natives to gather it for him to use elsewhere. Tropical fruits would rot on the ground before the natives would use them commercially. Until the United Fruit Company organized trade in tropical fruits, the banana was unknown to world commerce.

(Photograph from Wide World Photos)

FIG. 12. TROPICAL LIFE

Effect of the Cold Zones. The extremely cold climate of the frigid zone, on the other hand, produces little raw material for commerce, and what little there is produced, is of animal origin. Man is forced to struggle for a bare existence and relatively few inhabitants are found in these regions. Even the wonderful skill which the Eskimo shows in adapting himself to his environment results in an existence hardly better than that of a savage.

Effect of the Temperate Zones. It is from the temperate zones that about three-fourths of the world's commerce comes. Here we find all the great civilizations of history and all the great commercial nations and cities. Not a single capital of a powerful nation is located nearer the equator than thirty degrees. The climate of the temperate zone is one of the chief reasons for this condition. It permits the growing of crops only part of the year and so forces men to work hard during this time in order to store up enough food to last during the unproductive months. This naturally tends to produce men of an industrious, energetic, and intelligent type.



(Keystone View Company, Inc., N. Y.)

FIG. 13. NORTHERN ALASKA
Cold regions such as northern Alaska have little commerce.

Again, the changing seasons, with alternating cold and heat, make these the healthiest regions in the world, and this in turn makes the healthiest men. Here, nature forces men to work hard, but not so hard but that they have time for mental growth and the pursuit of the higher things in life. The great bulk of world trade comes within the temperate zones; whatever commerce has been developed elsewhere has been largely developed by men who originated within the temperate zones, and who have directed and organized the work. While there are peoples within these zones who have contributed little to commerce, it has been due to other factors than climate, such as topography, isolation, race, and backwardness.

Modifiers of Climate. The climate of a region depends upon the temperature and moisture of the air. These in turn are modified and affected by latitude, altitude, topography, winds, and ocean currents. The presence or absence of any of these modifiers determines the climate of a region.

Effect of Latitude on Climate. Latitude is the distance of a region from the geographical equator. The sun's rays are more vertical and direct at the equator than at any other place in the world and so tend to make this the hottest region in the world. The rays become fewer and more slanting as we approach the poles, making the temperatures less and less hot. Also, these rays are somewhat cooled by having to pass through more atmosphere as they slant more.

If there were no other modifiers of climate, we could easily determine the temperature of a place by its distance from the equator, or by its latitude. Then, by drawing lines parallel to the equator, we could establish fixed climatic zones. However, as there are other factors entering into climate we shall find this to be impossible and the boundaries to the climatic zones to be very irregular and constantly changing.

Effect of Altitude on Climate. For every one thousand feet we go up in the air, we find it as much cooler as if we had gone three degrees towards the poles away from the equator. This is because the air receives its heat by radiation from the earth. The higher up we go, the thinner the air becomes and the less able to hold radiated heat from the earth. There are mountains on the equator itself so high that a tropical climate is found at their base, then higher, a temperate climate, and finally on the peaks, snow and ice the year round.

Thus we find regions with a temperate climate within the boundaries of the tropical zone. It should be noted here that while one good effect of elevation is colder atmosphere, a serious defect is that the air is more rarified and exertion becomes more difficult. This weakens the energy of people living on these higher altitudes and also governs to some extent the kind of animals and plants found there.

Effect of Topography on Climate. Topography means the surface features of a region such as mountains, slopes, valleys, plains, high lands, low lands, rivers, coast line, water areas, and other factors which make up the surface relief of a region. The topography of a region affects its climate to a very marked degree, as we shall see.

Effect of Mountains on Climate. We have already noted how the altitude of mountains makes their own temperature cooler. But mountains also have a powerful influence on the neighboring regions, especially when they intercept prevailing winds and so change the climate on the leeward side. Whatever water the winds have is dropped on the windward side of the mountains, because the air is forced upwards against the side of the mountains, becoming cooler as it ascends and precipitating moisture in the form of rain.

The Himalayas stop the winds from the south and force them to drop their moisture as rain, so making India productive and the regions north of them unproductive and dry. The winds from the Pacific Ocean are intercepted by the Sierra Mountains, giving California her water supply and robbing the regions eastward of rain. The direction of the mountain slopes plays an important part in agriculture. The southern slopes are much preferred in the northern hemisphere, especially for fruit growing, because the sun's rays fall more directly on them. In the southern hemisphere, the reverse is true

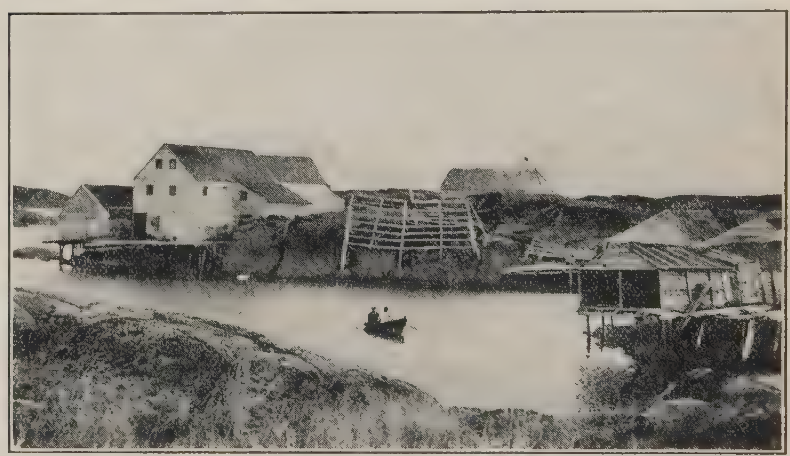
Effect of Land and Water Areas on Climate. The size and distribution of land and water areas affect the climate of a region decidedly. Land areas are heated by the rays of the sun much more quickly than water areas. They also give up their heat much more rapidly when the sun's rays are withdrawn. Large bodies of water, therefore, have a steadying influence on the temperature of the air over and near them. In the interior of a country, far from this steadying influence of large bodies of water, the extremes of heat and cold, day and night, summer and winter, are much greater than in regions lying on the sea coast in the same latitude. The grape industry of New York is located on the Finger Lakes because of the modification of climate, due to breezes from these water areas which temper the frost conditions until danger is past.

Winds and Climate. Whether winds are warm or cold as they blow over a region, has a great influence on its climate. The cold winds from the north affect our western states and make them colder than they would otherwise be. The warm winds blowing on our Pacific coast make it a delightful place. Winds are the carriers of moisture and the even distribution of rain may be laid to them. We have already seen how this moisture may be dropped when these winds blow against mountains. Cold winds becoming warm collect moisture and thus make arid regions and deserts.

Effect of Ocean Currents on Climate. Ocean currents affect the climate of regions near them when the prevailing winds blow shoreward. Thus the warm Gulf Stream makes the climate of northwestern Europe and England what it is, while the cold Labrador Current chills Labrador and makes it a cold, bleak, unproductive region although it lies in the same latitude as England. The shores of our western coast are warmed by the Japanese Current, while the shores of New England are cooled by the Arctic Current.

Climatic Zones. There are three climatic belts or zones of temperature: the torrid, the temperate, and the frigid.

The last two are subdivided into northern and southern. These zones can not be determined by drawing lines of latitude at certain distances from the equator, because of the modifiers of climate. They are bounded by imaginary lines called isotherms, which connect places in the world which register the same temperature at some given time. These isotherms, which bound the zones, are necessarily very irregular and never parallel. The isotherm of 70 degrees Fahrenheit is taken as the boundary of the torrid zone, while the isotherm of 30 degrees is taken as the boundary of the temperate zones. The isotherm which connects the hottest places of the world is called the thermal equator. It never coincides with the geographical equator, but lies north of it most of the time.



(Photograph from Wide World Photos)

FIG. 14. A LABRADOR FISHING VILLAGE
Labrador is much colder than England although in the same latitude. It is chilled by a cold ocean current.

Seasonal Changes. Owing to the fact that the earth inclines on its axis as it goes around the sun once a year, we find the vertical rays of the sun moving northward until they are over the Tropic of Cancer in June, and then moving southward until, six months later in December, we find them over the Tropic of Capricorn. As the isotherms follow this movement, we find the climatic zones moving towards the north in our summer and southward in winter, thus causing the seasons and annual changes in temperatures. The extremes of temperature during these seasonal changes, as well as the average temperature, have an important effect on the plant and animal life of a region. Not only is the temperature of a region affected by this movement, but also the humidity, because of the direction of winds which change with the seasons.

(Photograph from Wide World Photos)

FIG. 15. A SAILING VESSEL

Effects of Winds on Commerce. In addition to their effect on climate, winds also play an important part in the carrying of the world's commerce, although not so much so since the advent of steam vessels. Even now, in the days of powerful steamships, they aid or retard the progress of the ship. There are two kinds of winds which figure considerably in commerce. They are the trade winds and the westerlies. The direction of these winds can be counted on with accuracy throughout the year.

Winds and Calms. As the hot air rises over the thermal equator it becomes cool and deposits its moisture as rain almost continually in the equatorial calms. As more hot air keeps rising under the cooled air, this can not come down again, and so moves northward and southward, high above the surface of the earth. These moving currents of air are called the anti-trade winds. The cooled air comes down again at a distance of about 40 degrees from the thermal equator, where it creates a belt of clear, calm weather called the tropical calms, because of their proximity to the Tropics of Cancer and Capricorn. Some of this cold air starts again towards the equator, again is drawn in by the rising hot air there and becomes the trade winds. Some of it turns poleward and becomes a part of the westerlies.

Westerlies. The westerlies are winds which blow in the temperate zones, on the poleward side of the tropical calms. These winds are caused by the whirling of the earth and blow from the west with a slight poleward tendency. They are not so steady and regular as the trade winds and vary much more in their speed.

Rainfall. We all know what an important part in commerce and industry rainfall plays, since the agriculture of a region depends upon it. About twenty inches a year is considered sufficient to carry on farming if it is well distributed throughout the year, for not only the amount of rain affects agriculture, but also the time when the rain falls. There are some regions like Palestine where there is sufficient annual rainfall but, because the rain does not come in the growing season, farming is not successful. On the other hand, there are regions where the amount of rainfall is less than twenty inches, but because it comes at the right time during the growing season, the regions are successful in raising crops. In some cases where the amount of rainfall is too small for agriculture, there is enough for grazing, like the far western plains of the United States. Too much rain is as bad for successful farming as too little. The Amazon River Valley illustrates how too much rain is detrimental to agriculture.

Causes of Rainfall. Rain is caused by three processes: evaporation of moisture from the surface of the earth, transportation by winds, and condensation. Evaporation, naturally, is much greater over large bodies of water like the ocean than over the land. When moisture is evaporated into the air it is carried along by winds. These winds, blowing towards a warmer region, become warmer themselves and can take up and retain more moisture than winds blowing towards colder regions.

So we find that the trade winds, beginning as dry winds at the tropical calms become great absorbers of moisture as they approach the thermal equator. Unless intercepted by mountains, they carry this moisture until they become cooler upon rising over the thermal equator, when they drop it in the form of rain. Thus, in the equatorial calms we find almost continual rainfall. As this belt travels north and south with the seasons it gives a wet and a dry season to tropical lands. When trade winds are intercepted by mountains, they deposit their moisture as rain on the windward side of the mountains.

The southeast trade winds blowing against the Andes Mountains are forced upward, and their moisture is condensed into rain which falls on the east side of the mountains and creates the copious rainfall of the Amazon River Valley. The monsoons, blowing from the Indian Ocean landward in summer, take up moisture until they strike the Himalaya Mountains and are forced to deposit it. The dry season in India is caused by the reversal of the monsoons. The westerlies, blowing against our western mountains, deposit their moisture on the western side, then descending on the east side of the mountains become warmer and warmer and so take up moisture, thus causing the aridity of our western plains and our deserts.

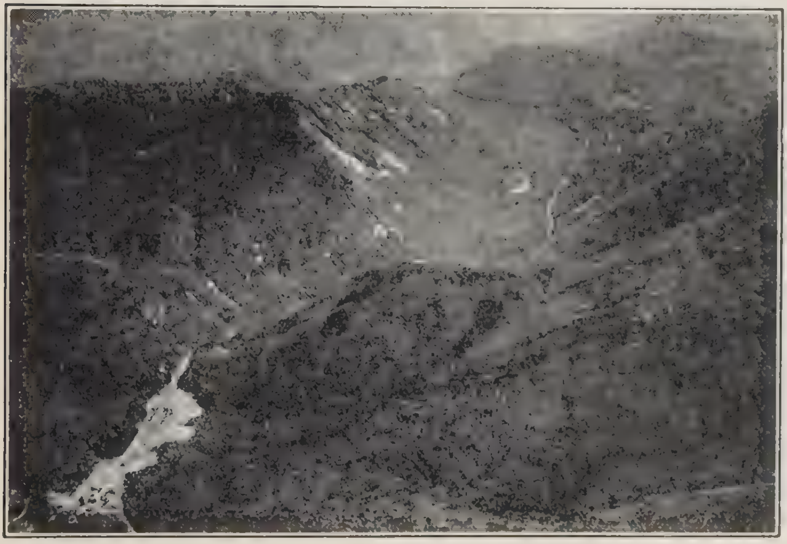
Deserts. All deserts are caused by the fact that the winds which blow across them have been deprived of their moisture, are becoming warmer, and are again taking up moisture. This may be due to the winds having been intercepted by mountains, as in the Gobi Desert in Asia, or it may be due to dry winds becoming warmer and blowing towards warmer regions, taking up moisture as they go, as in the Sahara Desert. High altitudes and high latitudes have little rain owing to the fact that the air having become cooler has already deposited its moisture.

TEXT QUESTIONS

1. What is the most important physical factor affecting commerce? Why?
2. Why have the tropics not been developed by native races?
3. Show the benefits to commerce of tropical development under the supervision of the white man. Illustrate.
4. Why are not the cold regions commercial?
5. Prove that the climate of the temperate zone is the most favorable to commerce.
6. What effect has the temperate zone on the character of men?
7. What effect has the temperate zone on the health of men?
8. Name the chief modifiers of climate.
9. Show the effect of latitude on climate.
10. Prove that latitude does not altogether determine the temperature of a region.
11. In some cases, the effect of altitude is good and in others it is bad. Discuss this statement.
12. Discuss the effect of mountains on climate.
13. Why is climate more steady near large bodies of water?
14. Show how winds affect climate.
15. What ocean currents warm neighboring lands? Can you locate these currents and lands?
16. What ocean currents cool neighboring lands? Can you locate these currents and lands?
17. Define (1) isotherm, (2) thermal equator.
18. What isotherm bounds the torrid zone?
19. What isotherm bounds the temperate zones?
20. What causes the seasonal changes?
21. Explain (1) tropical calms, (2) equatorial calms, (3) trade winds, (4) westerlies, (5) anti-trade winds.
22. Discuss the effects of rainfall on agriculture and commerce.
23. How is rain caused? Explain fully.
24. Explain the wet and dry seasons of tropical lands.
25. Explain rainfall in five different regions of the world.

SECTION 2—TOPOGRAPHY AND MISCELLANEOUS FACTORS

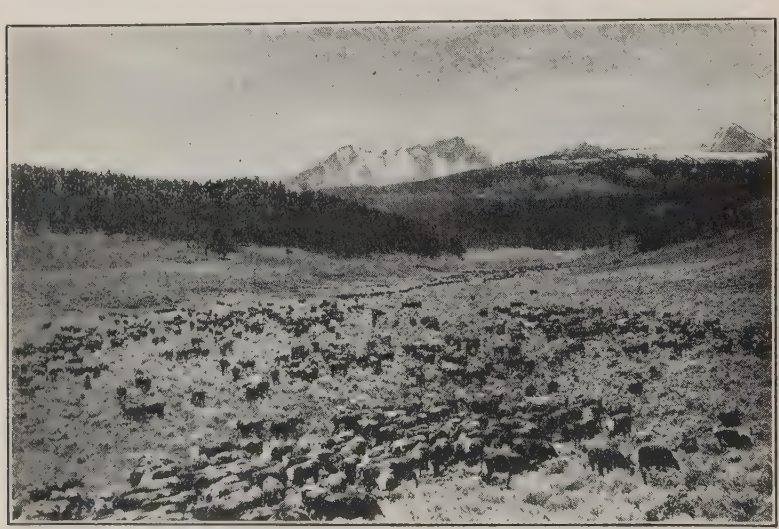
Importance of Topography. Topography, the surface features of a region, is second only to climate in its influence on commerce and industry. In large part the topography of a region affects the agricultural possibilities of a region and so its products. Unfavorable topographical conditions, even with favorable climate, limit production.



(Photograph from Wide World Photos)

FIG. 16. CRAWFORD NOTCH
Transportation flows through mountain passes.

Effect of Mountains on Commerce. The effect of mountains on climate has already been noted and we have seen how, by their direction, their interruption of winds carrying moisture, and their elevation, they affect regions nearby. In addition they also act as barriers to trade since they make difficult and almost impossible the transportation of commerce across them. An example of this is the way the Himalaya Mountains prevent overland trade between China and India. For years our Rocky Mountains prevented trade between the eastern and western sections of the country except by a long water route around South America. Only by wonderful engineering feats was railroad connection between the two sections made possible. For years the Pyrenees Mountains have successfully slowed up commerce by land between Spain and France, although the engineers will eventually make railroad connection through them possible.



(Photograph by Ewing Galloway, N. Y.)

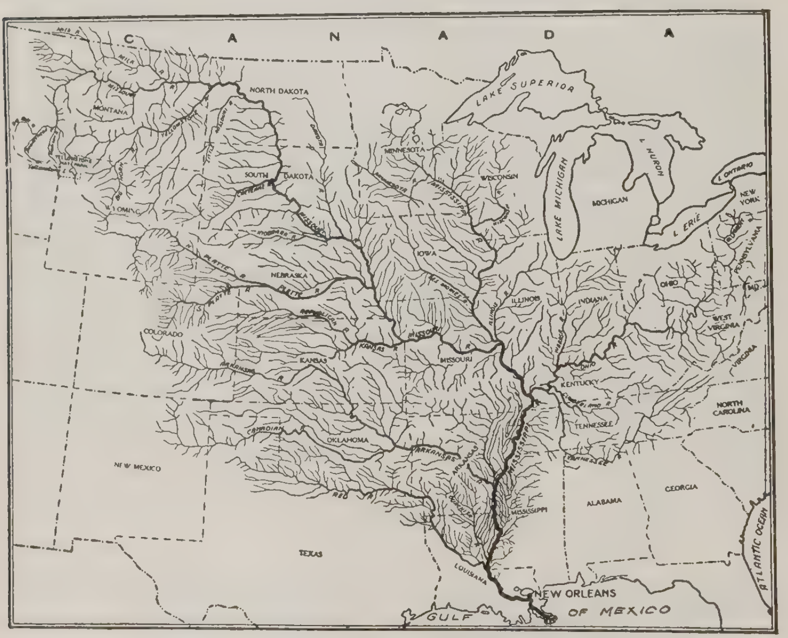
FIG. 17. PART OF A MONTANA RANCH
Mountain districts are frequently suitable for grazing.

Mountain Passes. Wherever there occurs a valley through the mountain ranges, even at a high elevation, it is called a pass and becomes important in that it favors transportation through the mountain range. The Kaiber Pass between India and Asia Minor takes care of most of the overland trade between these sections. The passes through the Alps form a channel for the trade between Italy and the north. Tunnels have been built at great expense to enable railroads to run between Italy and France and Switzerland. In the United States, the passes through the Rocky Mountains, such as the Marshall Pass and the Fremont Pass, are extremely essential in transcontinental railroad building.

Mountain Products. The plant life of mountains is limited by the low temperature of the elevation and the poor soil found there. The higher up we go, the nearer do we approach the freezing point which ends plant life. The soil on the higher parts of a mountain is poor because of the constant washing away down the slopes, of organic matter. In temperate zones, grass may grow in abundance enough to satisfy the grazing industry, and up some distance from the base, trees will grow well. So the mountain districts are chiefly limited to grazing and lumbering. In the tropics, tea and coffee thrive well on the lower slopes of the mountains, if they are so located that there is enough moisture, plenty of sunshine, and a quickly drained soil. Rubber also does well in some countries on the lower part of tropical mountains. Because of the geological formations found in mountains, minerals are more easily located and secured there. Where transportation is available, mining is found to be an important industry.

Plateaus. Plateaus are highlands with a more or less rugged relief. In the temperate zone they are generally too cold and dry to matter much to commerce, except possibly as grazing districts. They are inhabited by wandering people who live by tending their herds of cattle and sheep, principally the latter. In the tropics are found some plateaus which are more productive because of the rainfall and climatic conditions. Some of these in India and South America are even prosperous. Africa has a high plateau which could be productive if developed.

Plains. Plains are broad, flat regions with a low elevation where we find a large majority of the world's population and also a great amount of commerce and industry. Generally, plains are well watered and fertile because the soil from higher lands has been washed down onto them and has never been taken away. Agriculture flourishes on the plains and large cities spring up. The great granaries of the world are found here when the climate and soil are favorable and the use of machinery is practicable. Roads and railroads can be easily built at comparatively small cost and so the products can be transported to market cheaply. While minerals are generally lacking, they can be brought in without much trouble.



(Photograph from Wide World Photos)

FIG. 18. THE MISSISSIPPI RIVER SYSTEM
Our richest agricultural region is drained by this system.

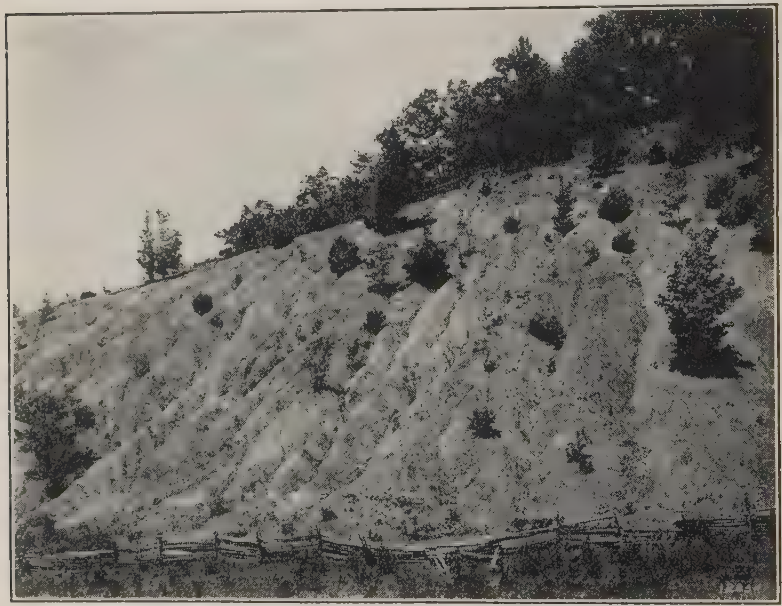
Sixty per cent of the people of the United States live on plains and lowlands at an elevation of one thousand feet above sea level or less, while about ninety per cent of the world's population is found on plains. The great river flood plains are the richest regions of agriculture in the world. The coastal plains near the ocean have the densest population, especially wherever good harbors are found.

The fact that New England has a coastal plain influences her industries immensely. Here the coastal plain is narrow and the fall line, where the rivers drop from higher elevations to the coastal plain, is near the ocean. Hence manufacturing sprang up along these rivers at this fall line because here was found ample water power, while near at hand was the ocean transportation for the finished product.

Coast Line. Regions favored in location by being near large bodies of water and good harbors naturally become trading regions. Lakes, rivers, and oceans afford a natural outlet by transportation for manufactured goods. Countries bordering on the ocean become maritime in their activity, when their coast line is so indented that good harbors are plentiful. The Mediterranean Sea was the medium of ancient commerce, and later the Atlantic Ocean made possible the tremendous foreign trade of its coastal peoples. Africa, which is three times larger than Europe in its area, has a coast line only three-quarters as long. This fact explains in part the difference in their commerce and industry. The western coast of South America is hampered in its commerce by poor harbors, while the Amazon River favors trade with its hundreds of miles of navigable water. One reason for the backwardness of China in commerce was her poor harbors, which have been greatly improved by white men.

Importance of Soil. The plant life of a region depends largely upon the character of its soil, if the climate and other growing conditions are favorable. All animal life is dependent upon plant life. Even meat-eating animals live on other animals, which in turn live on plants. Thus we see that the soil decides what plants can thrive in a region and this in turn influences the animal life of the region. As most of our commerce and industry is based upon plant and animal products, it is easy to see that soil plays an important part in the prosperity of any region.

Soil Formations. Soil is formed in various ways. Sudden expansion by heat and contraction by cold cause rocks to split into smaller and smaller pieces. Rocks are also split by roots growing into cracks and by water running into seams and holes and freezing. Glaciers slowly grind rocks into small bits. Rivers gradually wear away rocks on their sides and bottoms. Winds, laden with grit and sand, grind off tiny particles. Rocks are eroded by rain and waves. Certain chemicals found in the air, rain, decaying plants, and low forms of animal life are constantly acting on rocks and disintegrating them. In the temperate zone where the winter snows cover the leaves and dead plants and wet them so that they decay rapidly, vegetable mold or humus is added to the pulverized rocks and minerals, and makes a very fertile soil. Earthworms play an important part in soil formations and are particularly valuable in mixing the humus and pulverized rock.



(Photo by W. W. Ashe, Courtesy U. S. Forest Service)

FIG. 19. SOIL EROSION

In this instance, the soil is eroded as a result of deforestation.

Soil Conservation. Man has no control over some of the conditions favorable to plant life, but he has some control over the improvement and conservation of the soil. When a soil is deficient in certain elements, these may be supplied in the form of a fertilizer. Various chemicals may thus be supplied. Ammonia can be obtained through the use of barnyard manure. Lime, marl, guano, fish, seaweed, bone-ash, phosphate, refuse from the cotton seed, and slaughter house waste are used as commercial fertilizers. Soil also may be conserved by changing crops in a series of rotation, each crop extracting only certain elements from the soil. Sometimes fields are allowed to lie unused for a while to allow nature to supply the elements which have been robbed from the ground. By planting pulse crops like peas, beans, and clover, nitrogen may be returned to the earth, as these plants have little nodules on their roots which gather up the nitrogen and deposit it in the ground upon their decay. The surface of the soil may be conserved by attention to agencies which prevent its washing away.

Importance of Organic Life. Among the physical factors which affect the commerce of a region, we must consider the nature of its organic life. By organic life is meant its plant and animal life. Some plants and animals are friendly to man, while others are hostile. In so far as man is obliged to combat unfavorable plants and animals, so far is he hindered in his production. On the other hand, as he is aided by friendly plants and animals, so is he helped in his production. While other physical factors, like climate, topography, and soil, determine in large part what the natural organic life of a region is, man is able to modify these somewhat, by adaptation, and in many cases has changed it almost entirely, and so greatly benefited commerce.

Hostile Organic Life. A few illustrations will show how plants and animals may be hostile to man's progress and commerce. Vegetation is so rank in the tropics that oftentimes man is unable to successfully raise crops of his own choosing. There are spots in the world where no man lives because the plant life is so dense. Weeds, in all climates, compel the farmer to a relentless warfare to keep them from killing out the desired crops. In the case of hostile animals, we find the presence of wild beasts a source of danger in some regions and a source of great loss in others. In India, many people are killed annually by wild animals and snakes. The tsetse fly in Africa, which kills animals by its sting, has retarded the growth of the regions where it lives. Millions of dollars worth of crops are destroyed annually by insects and pests. The cotton boll-weevil is a source of tremendous loss to the cotton growers. Other pests ruin field crops and necessitate a great amount of costly effort to repel and control them. Many regions of the world are not commercial because of the presence of some disease, like malaria, caused by small living germs or low forms of life. Medical science is fast learning about these parasites and finding a means of combating them.

Friendly Organic Life. Practically all the animals and plants of commercial importance have been conquered and trained into usefulness by man. By intelligent methods, he keeps the plant enemies down and increases the plants which are desirable for food. Cereals and vegetables he improves constantly by seed selection, and cultivates them for his use and for commerce in general. Animals he tames and domesticates for his use as food, burden bearers, and clothing. By hard study he has learned to fight even the microbes which war on his health. And in the struggle with organic life, man is eventually the victor, turning whatever organic life is helpful to his use and fighting continually the hostile organic life, sometimes almost to its extinction.

Importance of Minerals. Our world commerce today would be impossible without the abundance of minerals and man's use of them. The mighty machines of industry and the great transportation agencies are built from minerals and run by the power generated by minerals. From the earliest times, the more complex commerce and industry became, the more dependence was placed on minerals. Present day civilization demands countless articles into which the various minerals go. Big business depends upon gold and silver as mediums of exchange. Invention follows invention and minerals are necessary to maintain them. Science is constantly working out new ways of using and conserving our mineral supply. Never before in history were minerals so much needed and used, and everything points to a still larger importance for them.

Distribution of Minerals. Minerals are scattered unevenly throughout the world and new deposits are being constantly discovered. Unlike plant life, mineral deposits are fixed in their locations and man can not alter their location by his efforts. Some minerals like iron, coal, and petroleum are generously distributed, while others like tin and platinum are found only in limited localities. Mineral deposits are more easily discovered in mountainous districts, because there the geological formations come to the surface. Some places are fortunate in having coal and iron in close proximity. Other regions are favored by having minerals near to the market and good transportation facilities.

Accessibility of Minerals. To be of the greatest value to commerce and industry, minerals must be accessible and the transportation of the ore fairly cheap. The easy access to the coal and iron deposits of England has tended to make her highly industrial. When transportation made the mineral deposits of coal and iron in Pennsylvania available, the iron and steel business became very important to the commercial and industrial life of the region. Later the Mesabi district, west of Lake Superior, became important for the great steel industry, while the favorable conditions for iron and steel in Alabama, supplemented by adequate transportation, has made her an important center in these lines. The great mineral deposits of Alaska only await cheap transportation for their utilization. Some day when organization and transportation make it practicable, the immense mineral deposits of China will be used.

TEXT QUESTIONS

1. What does topography mean? Illustrate.
2. Show how mountains affect commerce.
3. Name and locate some important mountain passes which greatly affect commerce.
4. Name the principal commercial products found on mountain sides. Why these?
5. To what kind of industry are the people of plateaus usually limited? Why?
6. Name the reasons why plains are so important to commerce and industry. Illustrate.
7. Compare the coast lines of Europe and Africa and show how they affect their commerce.
8. Prove the importance of soil to commerce and industry.
9. How is soil formed? Describe.
10. Discuss hostile plant and animal life and their effects.
11. Discuss friendly plant and animal life and their effects.
12. Prove the importance of minerals in commercial life.
13. In what way does the distribution of minerals and plants differ?
14. Why must minerals be accessible to be of value?
15. Illustrate how accessibility of coal and iron have affected the commerce and industry in certain regions.

PROBLEMS AND PROJECTS

1. Explain Egypt's former greatness in a hot climate.
2. Why is the development of the tropics such a problem? Can you suggest a practical solution?
3. Would the world be a better place to live in if the tropical climate prevailed everywhere?
4. Select some nations in the temperate zone and explain their backwardness in commerce and industry.
5. Why is it that the nearer we go towards the sun the colder it becomes?
6. What effect do the Alps have on the climate of Italy?
7. Explain the popularity of the seashore in summer.

8. On an outline map, trace an isothermal line for 70 degrees. Explain what factors pull it away from or towards the equator.
9. Discuss the effect of change in seasons on commerce.
10. On a graphic representation of the globe, show the location and general directions of the prevailing winds in April. Locate the calms.
11. In sailing from Liverpool to Rio Janeiro, what winds and calms would aid you and what ones would hinder you in July? In December?
12. Locate the regions of greatest rainfall on a map. Explain them.
13. Locate the deserts on a map. Explain why they occur in each case.
14. Is nature's law of the survival of the fittest justifiable in plant life? In our human relationships?
15. Alaska is rich in minerals. Why is it not more important commercially? Mexico? China?
16. Show how western Pennsylvania is particularly favored in minerals.
17. Make a list of the physical factors which affect the commerce and industry of your region.

TOPICS

1. Mountains in history.
2. The effect of some big river system on commerce.
3. Physical barriers to commerce.
4. The various kinds of soil.
5. The formation of minerals.

FOR CLASS DISCUSSION

1. Life in the tropics is more enjoyable than elsewhere.
2. Adversity is the mother of prosperity.
3. Iron is more valuable to commerce and industry than gold.
4. The physical factors in the north temperate zone are more favorable to commerce and industry than those of the south temperate zone.

CHAPTER IV

COMMUNICATION

Importance of Communication. Communication is a factor of commerce and also a result of commerce. It may be classified as a resultant factor of commerce. Communication originated because of the necessity of rapidly sending military and defense information for long distances. With the growth of commerce, it has become more and more important to commerce and now practically all modes of communication are devoted to trade. While it is used extensively in military and naval science, the greater use is found in commerce.

Messengers. We find an extensive use of couriers and messengers in ancient times among practically all the advanced nations. The Romans brought this kind of communication to a high organization by stationing horses and men at regular intervals throughout their vast empire for the quick transmission of information. This system was confined almost wholly to the military and wealthy classes and had little direct effect on commerce. The custom of sending special messengers to the court of another king gave rise to a class of special envoys, then later to ambassadors, and finally to the consular system of modern times. In a sense, the consuls are messengers and representatives of the home government and, as such, greatly aid the commerce of the world. The errand boy, the messenger boy, and the bank messenger all have an important place in present day commerce. The traveling man is a real courier of business and essential to commerce as it is organized today.

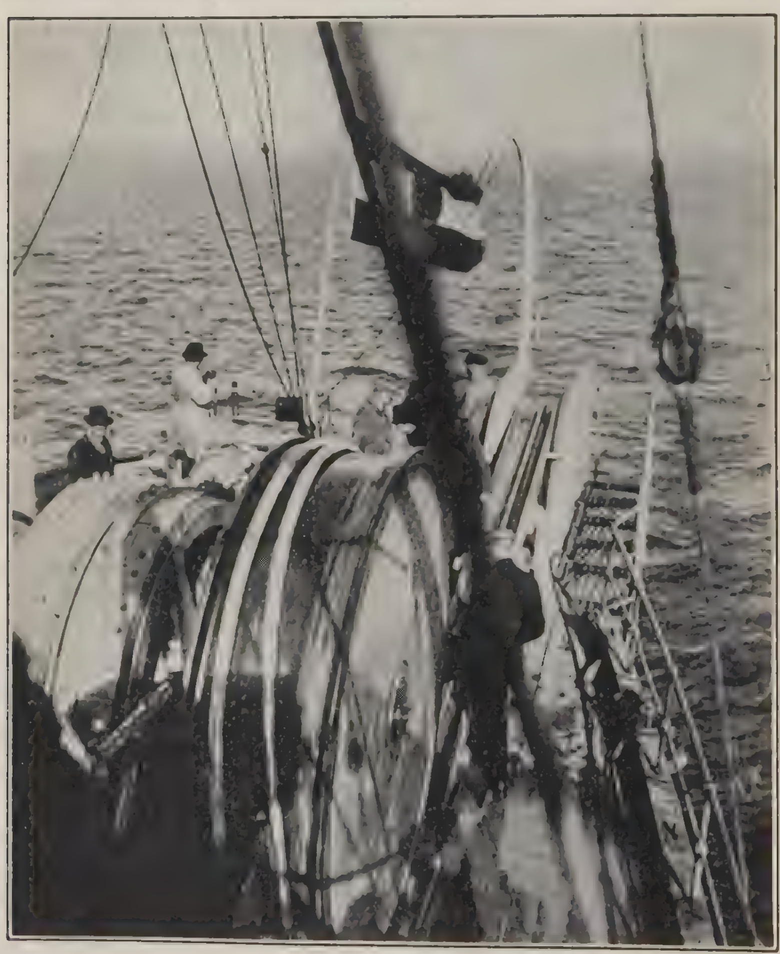
Signals. One of the earliest means of communication was by the use of signals. The Greeks and Romans of ancient times employed flags and torches to convey military information. The smoke signals of the American Indian are well known. The savages of Africa communicate information by the use of drums, some of which can be heard for over ten miles. In England, for many years, beacons were lighted on hilltops to tell of invasion or danger. The use of signals in commerce today is confined principally to maritime communication.

While lighthouses and shore beacons to warn sailors of dangers appeared early in history, it is not until comparatively recent times that they have become highly organized. Up and down our coast, we find lighthouses situated at strategic points, and these, with their various systems of flashes and horns, tell the mariner his location and danger. In time length of flashes and the length of blast of the horns, and the sequence, these signals aid the seaman to find his way. Electricity has been applied to the problem and we now have the submarine telegraph and submarine bells, which sound their information under waves.

Radio, with its radio compass bearings, helps ships locate their positions in the darkest and stormiest nights. The international codes have been so devised that, by the use of flags by day and lights by night, valuable information is signalled to other ships at some distance. Rockets still tell of disaster. Whistles blown on steamboats convey necessary information, especially in fog. The weather bureau sends out its warnings by means of flags flown from high masts. The use of the wig-wag and semaphore signals is a daily occurrence aboard ships.

On land, the great railways depend upon semaphores and colored signals to help the engineer of a train pilot his train over switches and through blocks. The block system, preventing rear end collisions, is in use everywhere and greatly adds to the safety of transportation of all kinds. Even the large auto traffic of our cities is controlled at busy corners by traffic signals, either human or mechanical.

The Telegraph. The next great stride in communication came with the invention of the telegraph in 1844. The use of the telegraph may be divided into railway, municipal, governmental, and commercial, all of which have a bearing on commerce. In 1850, the Erie Railroad introduced telegraphy to control the movements of its trains and this idea was soon adopted by all the railways of the world. Municipal telegraph includes fire alarms and police alarms. In many countries the government owns and controls the telegraphs. Commercial telegraphy provides the cheapest and fastest

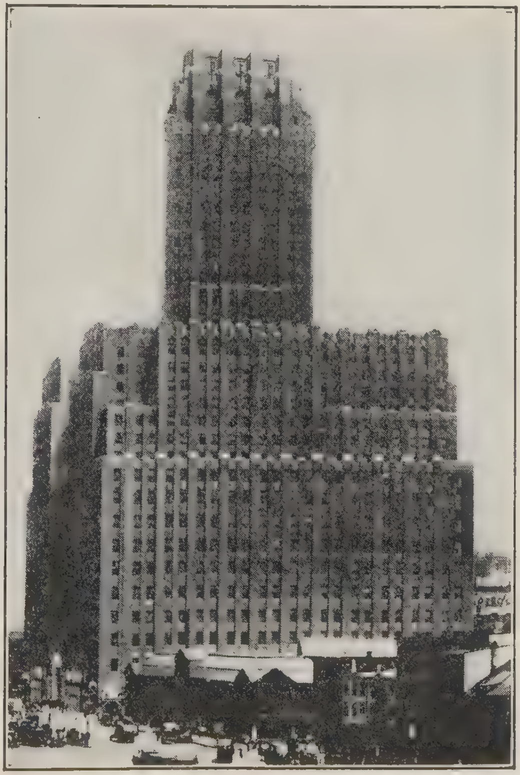


(Keystone View Company, Inc., N. Y.)

FIG. 20. LAYING AN OCEAN CABLE

communication we have for long distances at the present time. The introduction of night letters, whereby fifty words may be sent during the night hours at the same rate that ten words may be sent during the day, has greatly stimulated the use of the telegraphs. While there are about thirty telegraph companies, the Western Union and the Postal Telegraph companies are in control of most of the work of the present time.

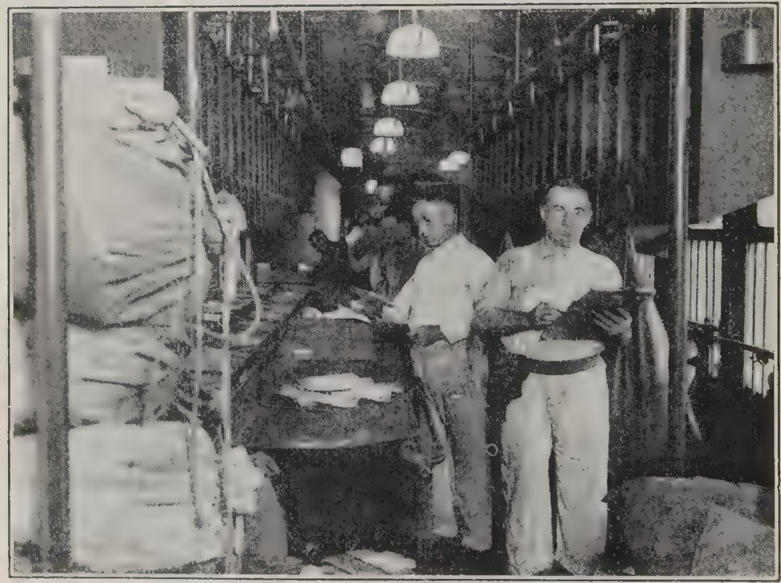
The Telephone. The telephone, invented in 1875 by Professor Bell of Boston, has grown in fifty years to be the greatest means of communication among business men, especially for comparatively short distances. The popularity of the telephone is shown by its increased use. It is an interesting fact that while the inhabitants of the United States number one-sixteenth of the population of the world, two-thirds of the telephones are in this country. This is one explanation of our commercial leadership. With this great growth have come traffic problems of tremendous size, and invention is keeping



(Keystone View Company, Inc., N. Y.)

FIG. 21. THE NEW YORK TELEPHONE BUILDING
The size of this building suggests something of the tremendous size of the telephone business.

pace with the demands. Wires in our large cities now run underground through cables instead of overhead; automatic dial machines are displacing human agents; and the telephone companies are devoting their great organizations to planning, not only for increased and better service, but for the great future growth in demand which they must face continually.



(Photograph by Ewing Galloway, N. Y.)

FIG. 22. RAILWAY MAIL CAR

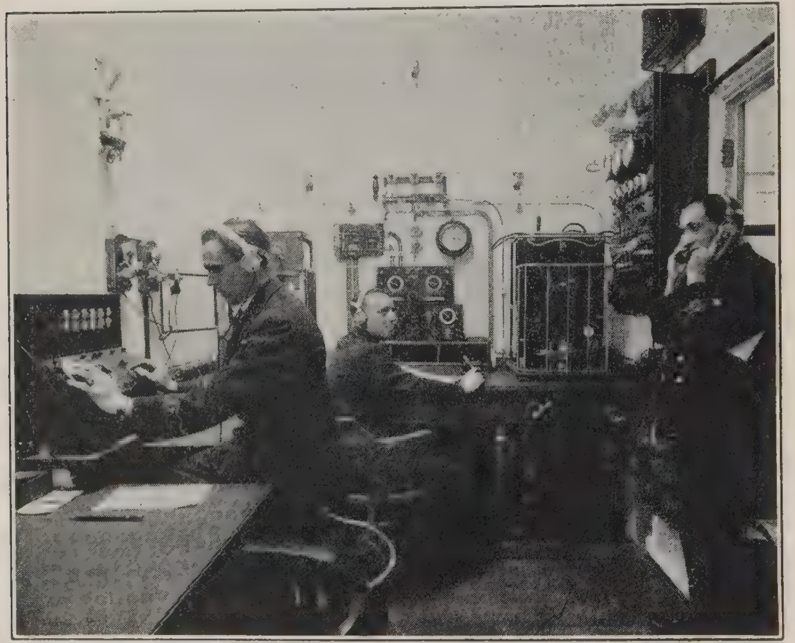
The Post-Office. One of the greatest aids to present day commerce is the regular and cheap postal service. The post was probably originated by the Romans for transmission of government messages. Later, about 1600, its importance as a means of communication began to be recognized and it gradually passed from royal control into private hands and then into the hands of the government. The price was reduced to a small amount to encourage letter writing and commerce and the penny post came into popularity. From that time on, the postal system grew rapidly in magnitude and service until, in 1875, the International Postal Union made world-wide service possible.

The present classification of mail falls into four divisions: first-class—letters, post cards, written matter, and sealed packages; second-class—newspapers and magazines which give information and which weigh less than four pounds, (exclusive of books); third-class—printed matter; fourth-class—parcel post, printed matter under four pounds, and books.

Special stamps are required for special delivery service, insuring quick delivery at the destination. Mail may be registered by the payment of a small fee. This registration insures against loss and enables the authorities to trace any loss and fix the responsibility for it. Merchandise may be sent C.O.D., which means that the post office will collect money due on the package before delivery. In addition to attending to the mail, the post-office system transmits money by postal orders. It also maintains banking facilities for those who wish to deposit money for safe keeping.

The introduction of the railway post office greatly speeded up the distribution of mail. While the train is en route, the mail is sorted and classified for immediate delivery upon arrival of the train at its destination. In this way, much time is saved and prompt deliveries are possible. It is thought best to keep a low rate on mail to encourage the distribution of information and commercial correspondence, as this will increase the commerce and hence the prosperity of a country.

Wireless. Wireless communication was invented by Marconi about 1900, and since then has been greatly developed by him and such men as DeForest. The ways in which wireless is used may be classified as transoceanic, marine, and broadcasting. Experiments have proven that radiophones and television are also practical. In transoceanic wireless, commercial messages are sent from continent to continent. In marine wireless, ships are able to communicate with land and with each other, and to locate their positions by means of the radio compass. Broadcasting covers not only entertainment purposes, but also has a distinct commercial bearing in the commerce of today, especially as means of advertising. One drawback of wireless has been its lack of privacy, except when codes have been employed. By means of what is called the radio beam wave, it has become possible to send messages through the air which can be received only by special apparatus or at certain places. The growth of wireless has been so rapid that much confusion in its regulation and control has been present. Government supervision and regulation, together with international agreements, are doing much to end this. With the increasing volume of communication necessary to the increased commerce of recent years, wireless communication has greatly relieved the pressure on wire communication, especially in cable service.



(Photograph by Ewing Galloway, N. Y.)

FIG. 23. RADIO ROOM, S. S. MAJESTIC

TEXT QUESTIONS

1. List the ways by which men communicate with one another. Which are common among business men?
2. Explain how modern means of communication are causes of commerce. Results of commerce.
3. Discuss the use of messengers from early times until the present time.
4. Make a list of the different kinds of messengers. What kinds are used in business today?
5. What signals are in common use on water today? Explain their use and purpose.
6. What kinds of signals are in common use on land today? Explain their use and purpose.
7. Discuss the use of telegraphy by railroads. By cities. By business men. By countries.
8. What two companies control most of our commercial telegraph service in the United States?
9. Prove that one cause of our commercial leadership is the extensive use of telephones in this country.
10. What efforts do the telephone companies make to keep up to present demands and anticipate future ones?
11. Why is the telephone preferred for short distance communication? The telegraph, for long distance?
12. Discuss the rise and growth of the post office.
13. Describe the various classifications of mail.
14. Make a list of all the different services rendered by the post office.
15. Why should a person always register a valuable letter before mailing it?
16. In what ways does the C.O.D. service aid commerce?
17. Give the advantages of the railway post-office service.
18. In what ways does a low postal rate on mail react to the benefit of commerce? Of the community?
19. Classify and explain the various ways in which wireless communication is now used.
20. In what ways does wireless communication affect the commerce and industry of to-day? Explain.

PROBLEMS AND PROJECTS

1. Compare the means of communication in Revolutionary times with those of today.
2. Give one example of a sign or signal that is universal to all.
3. Why do railways prefer the use of the telegraph to that of the telephone in train dispatching? Explain.
4. What signals does your local transportation company use?
5. Explain the block system of signals on a railroad.
6. Explain how cable messages are sent and received.
7. What are code messages? Why are they used?
8. Explain the popularity of the telephone in this country.
9. Explain briefly the principles involved in wireless communication.

TOPICS

1. The telephone.
2. The future of radio.
3. The air mail.
4. The post-office and methods of handling the mail.
5. The effects of wireless communication.
6. The effects of radio broadcasting.
7. Television.

FOR CLASS DISCUSSION

1. The government should own and control the telephone systems.
2. The government should have absolute control of radio broadcasting.
3. Wireless communication will eventually displace all wires.
4. Express companies should be operated by the post-office.
5. All cables should be controlled by the League of Nations.

CHAPTER V

TRANSPORTATION

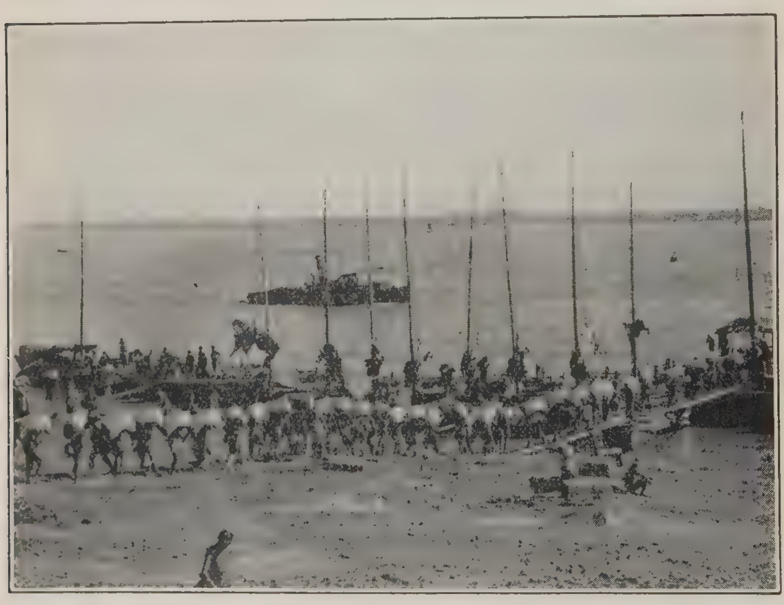
SECTION 1—TRANSPORTATION ON LAND

Importance of Transportation. Transportation is one of the most important resultant factors of commerce. Commerce creates transportation and in turn is greatly advanced by transportation. By means of transportation, the surplus products of one region are carried to another region and exchanged for a surplus there. Without adequate transportation facilities, a region necessarily becomes self-supporting and non-commercial. Through transportation, regions may produce products for which they are particularly well adapted and exchange these for articles from elsewhere, which in turn have been much more easily produced there. Thus geographical division of labor becomes common and everyone profits by it.

The various modes of transportation in the order of costs are man power, pack animals, horse-drawn carts, automobiles, railroads, and boats. One of the highest costs in transportation is the loading and unloading where man power is used. Thus the automobile truck is sometimes more economical for short hauls than the railroad, because it saves handling by hauling direct to the destination.

Human Porters. This was the most primitive form of transportation and is still in use in certain communities, regions, and countries, where overpopulation makes human labor cheap. Practically all savage tribes "tote," most of the work being done by the women. In Japan and China, where animals are few because of the demand for the use of the land to support the people, man power is used extensively to carry. This man power is supplemented and aided by the use of man-driven wheelbarrows in China and the jinricksha in Japan. In some parts of Africa, human porters are necessary because of the region traversed, and also because of the tsetse fly which is deadly to all animals.

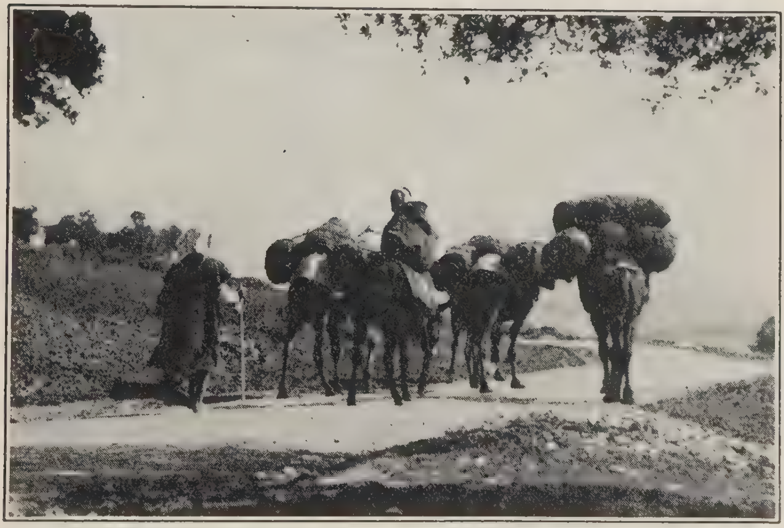
In commercial centers, men are used largely as longshoremen for loading and unloading the great ships at the wharves. While some kinds of freight can be handled by machinery, much of the package freight and bales must be handled and carried by porters. Even in our large commercial establishments where articles are delivered by trucks, helpers or lumpers are necessary to carry the packages into the house. Quite frequently man power in carrying a ton of coal from the coal wagon into the cellar is a more costly process than transportation many miles by other means.



(Photograph by Ewing Galloway, N. Y.)

FIG. 24. CHINESE COOLIES AS PORTERS

Pack Animals. The domestication and use of animals as means of transportation was a great step forward. Animals are still used as pack animals in many regions of the world where other forms of transportation are impracticable. Burros are used as pack animals in the mountainous regions of the Americas, in Mexico, in Europe, and in some parts of Asia. The llama is used on the trails of the Andes Mountains in South America, and is especially valuable in high altitudes. The camel and elephant are used as pack animals in tropical countries, the camel being particularly well adapted for caravan transportation in desert regions. Dogs are used as pack animals in the Arctic as well as for pulling sleds. The yak is the pack animal of the Himalaya Mountains. Thus we find animals being used to carry packs upon their backs, the kind of animal depending in a large part upon its adaptability to the particular region.



(Keystone View Company, Inc., N. Y.)

FIG. 25. A CAMEL CARAVAN IN NORTH AFRICA

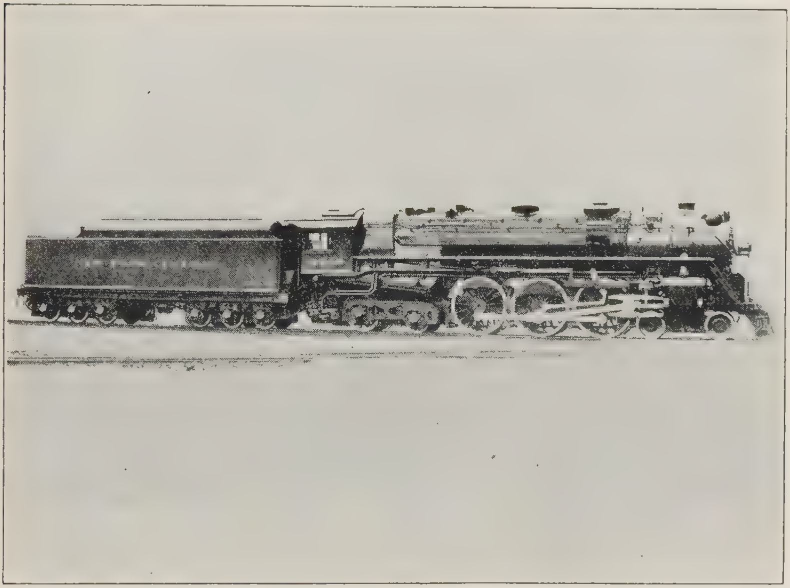
Draft Animals, Roads. Primitive man early discovered that heavy loads could be moved more easily by placing rollers under them, and from this discovery to the invention of the wheel was but a step. The first wheels were probably made from the cross section of a large tree and were connected with a wooden axle. From this, followed the chariot and the creaky, unwieldy carts of the ancients. During all the great migrations of history, wheels have played an important part. With the introduction of wheels, roads became necessary. Beginning way back in ancient Mesopotamia and continuing down through the times of the Persians and the Romans, we find much attention given to their construction. The Roman roads were famous, and many of them are still used to this day. During the dark ages, road making fell into a bad way as most of the transportation was by horseback and pack animals. About 1600, road building came back into importance.

In this country, the first roads followed the old Indian and buffalo trails and were extremely crude. As the necessity for roads increased, turnpikes were constructed by private companies which were allowed to charge a toll for their use. As the movement towards the west increased, the government took an interest in road building and the National Road was built from Cumberland, Md., to Vandalia, Ill. Over this road went stage coaches and Conestoga wagons. These wagons were constructed for rough use and later became the "prairie schooner" of the western plains.

With the advent of the automobile, people became awake to the advantages and economy of good roads, and now there is a movement everywhere for improvement. This is somewhat hindered by the division of jurisdiction of the various local, state, and federal governments, but gradually the road conditions in our country are becoming more and more satisfactory through proper cooperation. We are beginning to realize that poor rural roads place a great handicap on the American farmer in the cost of getting his produce to market. Frequently it costs him more to get his crop to the station than to get it from there to London. The returns from good roads, in the form of cheaper and quicker transportation facilities, more than justify the large initial investment necessary.

Railroad Transportation. Beginning with the Baltimore and Ohio in 1829, the railroad systems have grown rapidly.

The year 1863 saw the beginning of the great continental lines which were aided by the United States Government. Then followed a period of overexpansion and great financial losses. This period, in turn, was followed by the consolidation and mergers which resulted in the extensive railroad systems of today.



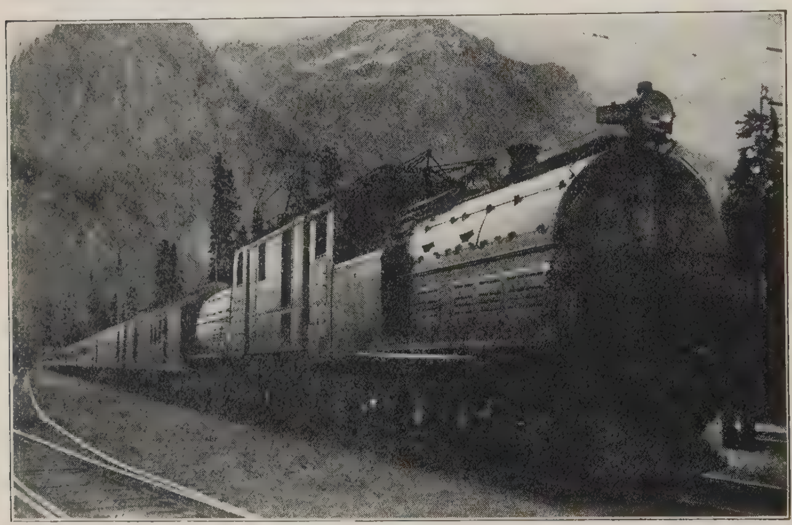
(Courtesy of New York Central Lines)

FIG. 26. FAST PASSENGER ENGINE

These systems are the Vanderbilt, the Pennsylvania, the Harriman, the Hill-Morgan, the Morgan, the Gould, the Hawley, the Moore, the Rockefeller, the Walters, and the Independent Systems. These great groups of railroads control three-quarters of the total mileage in the United States, and in some regions they are in complete control. The consolidation into large systems has eliminated the costly competition of earlier days and has resulted in much improved service. Most of the main trunk lines run east and west following the main lines of commerce in the United States.

At first, the railroads were allowed to fix their own rates and do about as they pleased. The Interstate Commerce

Commission was created by Congress to regulate the railroads doing business in more than one state. This commission has gradually become more powerful until now it has absolute power to regulate the interstate railroads and to fix minimum rates. State commissions regulate intrastate railroads, those doing business wholly within the boundaries of one state. In Europe, most of the railroads are owned by the government. This explains, in part, the backwardness found there. The railroad mileage in the United States is over one-third of the world mileage.



(Courtesy of Chicago, Milwaukee, St. Paul R. R.)

FIG. 27. TRAIN ELECTRICALLY OPERATED IN THE MOUNTAINS

The railroads have made wonderful advances in service and equipment in the past few years. Steel has made better rails, better cars, and better locomotives possible. We now have tank, refrigerator, heater, ore, coal, fruit, livestock, and other specialized cars for merchandise. For passengers, we have special cars like the sleeping car, the dining car, the parlor car, the observation car, the buffet car, while the standard passenger coach is far superior to that of a few years ago. Our engines are capable of drawing many more cars and drawing them faster than formerly.

The railroads in this country have an enviable record for safety. Automatic couplers, air brakes, and other safety devices of all kinds keep the death list very low in comparison with the hundreds of thousands of passengers carried daily. The gradual abolition of grade crossings will make this record compare even more favorably with the European systems.

In some systems, electric engines are now becoming an important factor in pulling trains and will be used more and more in the mountain districts and near large cities. Electric traction also is being used in various short lines which act as feeders to the larger trunk lines. Automobile busses, owned and operated by the railroads, are displacing steam trains on short and unprofitable lines.

The Automobile. The gasoline-driven automobile is an important agency of transportation. Its comparatively cheap power and ease of operation make it highly desirable. In fact, it has quite largely displaced horse-drawn vehicles in our cities because it is cheaper, quicker, and more powerful. It competes with railroad transportation, especially in short hauls. It can carry its load in smaller units, direct from the producer to the consumer without the costly intermediate loadings and unloadings and consequent costly handling necessary on railroads. It saves many of the usual delays by its direct service.

Many large passenger busses now run on a regular schedule between important terminals, and fill in a need for frequent service in small units. The railroads, in self defense, are adopting this method of local transportation and using the busses as feeders. The competition of the automobile with the railroad has had a serious effect on the latter, so much so that great consideration is now being given to a readjustment of local transportation in many places.

The automobile truck has proved its worth on the deserts, and in many places is displacing pack and caravan animals. The invention of the caterpillar tread has made the use of the truck possible in sandy and rough country.

TEXT QUESTIONS

1. Show how transportation is a cause of commerce. Show how transportation is a result of commerce.
2. Make a list of the different modes of transportation in the order of their cost.
3. Why are human beings used as carriers in China? In Africa? In New York? In your own locality?
4. List the different animals used as pack animals. Tell where each is used and why it is used there.
5. Discuss the origin of wheels and roads. Make a list of all the different draft animals you know.
6. Why did the Romans build such good roads?
7. Discuss the history of road building in the United States up to the advent of the automobile.
8. Show how the automobile has greatly helped in the growing demand for good roads.
9. Discuss the statement, "The returns from good roads justify their cost."
10. Name the principal railroad systems of this country.
11. Why do our railroads run mostly east and west?
12. What part of the railroad mileage of the world is found in the United States? What part of this is under the control of the large systems?
13. What is the Interstate Commerce Commission? What are some of its duties?
14. How are intra-state railroads regulated?
15. Show how the consolidation of railroads is beneficial and economical.
16. Show the improvements in railroad service and equipment in the past few years.
17. Name and describe some of the safety devices used on our railroads.
18. Where is electricity used by our railroads? Why?
19. Why are some of our railroads using automobile busses to supplement their service?
20. Why are automobiles displacing horses in our cities?
21. Give the advantages and disadvantages of automobile busses and trucks as carriers.

SECTION 2—WATER AND AERIAL TRANSPORTATION

Inland Navigation. From the time when primitive man first learned to propel himself astride a log over the water, the use of waterways as a means of transportation has been steadily increasing in importance. Man soon found that the same amount of power would move a much larger load over the water than over the land. As water transportation is cheap, heavy, non-perishable freights are moved over it whenever possible.

The rivers of Europe were the natural highways for the commerce of her countries. Today Europe leads all other continents in the use of inland waterways. A great network of canals, connecting all the important rivers in Europe, greatly increases the facilities of this mode of freight carrying. The rivers of Asia are used mostly for local commerce, although a few permit the entrance of ocean going boats.

African rivers play an unimportant part in her transportation of commerce, due to the fact that the fall line of the rivers is close to the coast. South America is particularly well favored by navigable rivers, and ocean going steamers penetrate her eastern coast for hundreds of miles. By the use of lighter draught boats, many more miles are added to her inland waterways.

In North America the rivers furnish almost 20,000 miles of inland navigation. The Mississippi and its tributaries furnish about 10,000 miles of waterway for trade carrying. The commercial availability of the Atlantic seaboard rivers is limited as the fall line is near the coast. Several cities have sprung up along this fall line, taking advantage of the power afforded and the natural outlet to the sea. The Pacific Coast has few navigable rivers and few natural sea ports. The Great Lakes are our greatest asset in inland water transportation. The amount of traffic over them is tremendous, especially in ores and cereals.

Canals. Canals are important features in world commerce. By means of canals, rivers are connected and supplemented, falls and rapids are avoided, and direct transportation to distant terminals is secured, thus saving the costly loading and unloading of freights. Canals are used mostly for carrying heavy, bulky, nonperishable freights, like coal, ore, lumber, and grain. The railroads made big inroads on the use of canals and some canals consequently fell into disuse and were abandoned.

(Photograph by Ewing Galloway, N. Y.)

FIG. 28. THE S. S. OLYMPIC

There are about forty canals in the United States today, with a total mileage of about two thousand five hundred miles. The longest of these is the famous Erie Canal in New York, connecting the great lakes with the Hudson River. Most of the mileage in canals is confined to barge canals which are located inland. Some canals have been so constructed that they permit the passage of large ships and are called ship canals. The Erie Canal has been deepened to a depth of twelve feet. The Sault Ste. Marie Canals, connecting Lake Superior with Lake Huron, although but a little over a mile long, carry twice as much tonnage as the Suez Canal, notwithstanding the fact that they are closed for several months each year by the ice. The Welland Canal around Niagara Falls and the St. Lawrence

Canals in Canada form an outlet to the sea for good sized ships.

The more important ship canals that aid world commerce are the Panama Canal, the Manchester Ship Canal, the Kaiser Wilhelm Canal, the Suez Canal, and the Corinth Canal. These canals, like the smaller barge canals, may be of two kinds, a sea level canal with no different levels or a lock canal with several different levels, the boats being raised or lowered to the various levels by means of locks. Thus, the Suez Canal is a sea level canal with no locks, while the Panama Canal is a lock canal with different levels. The big ship canals have had a tremendous influence on world commerce by shortening the distances between ports, and so stimulating trade between more distant countries.

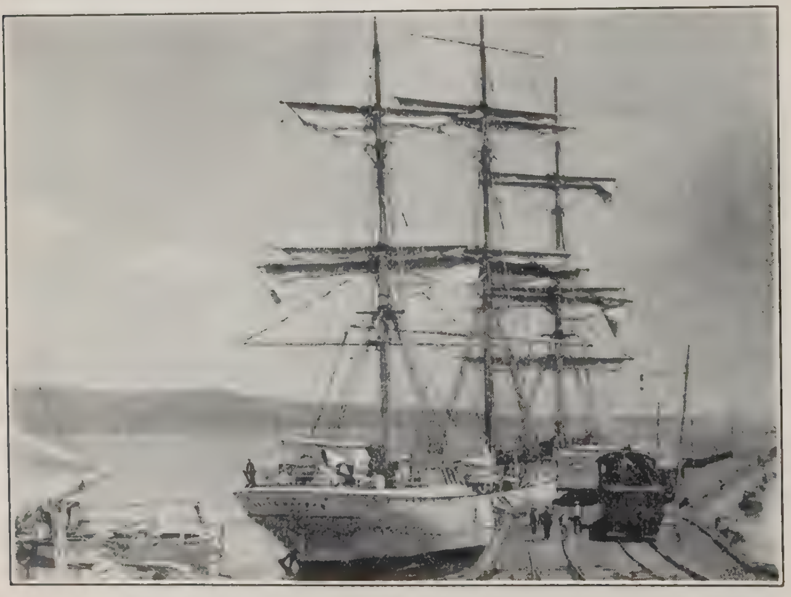
Ocean Transportation. The ocean is the great natural highway of commerce. While navigation was limited to the small confines of the Mediterranean Sea, naval architecture made little progress. But the fifteenth century saw the beginning of great improvements in shipbuilding and navigation. The keel made sailing into the wind possible, while the invention of the compass made it possible to sail out of sight of land. The great discoveries in the early part of the sixteenth century opened up possibilities which demanded larger and better constructed boats. The square-rigged and later the schooner-rigged vessel emerged as types.

New England, with her natural resources plus the inventiveness of her people, took the lead in shipbuilding, and the United States soon captured the supremacy of the marine carrying trade. This she held until the middle of the last century when the steam vessels, at first wooden and later iron, began to displace the sailing vessels as commerce carriers. Great Britain took the lead in this kind of boat and so gradually took the first place as a marine carrier.

The opening of the Suez Canal in 1869 gave a great impetus to steam driven vessels because, by using the canal, steamers could cut down the time from India to England, while the sailing vessel found it too costly to use the canal because of the surrounding calms and because of the tolls.

The United States, from the time sailing vessels were largely displaced by steam vessels, has steadily lost her place as a sea carrier and has become relatively unimportant in her merchant marine.

Much of the freight carrying on the ocean today is still done by sailing vessels. Many of these are now made of steel and carry auxiliary gas engines which propel them in harbors and in calms. Much of the loading and unloading is also done by these gas engines on sailing vessels. These ships have the advantage of having more space for freight in proportion to their size than do steam vessels. While they are slower and more irregular in time schedules, they have the advantages of being immensely cheaper to operate and less costly to build.



(Courtesy Canadian National Railways)

FIG. 29. A SQUARE-RIGGED SAILING VESSEL

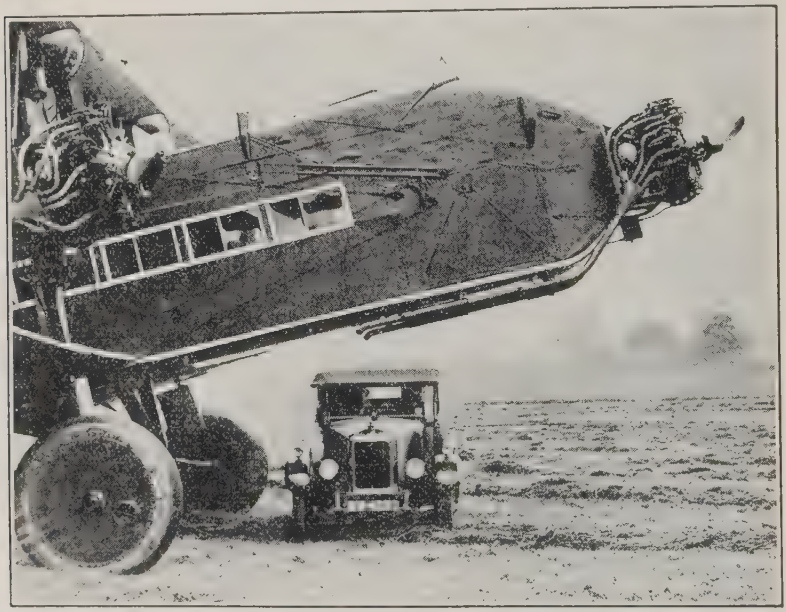
Types of Ships. We may distinguish two kinds of steam vessels. There is the liner which plies between regular ports on a regular schedule. These ships carry the lighter freight and passengers. They are generally fast boats and depend upon their speed and regularity to secure and hold their type of business. These liners are supplemented by feeders, or short lines, which gather up the freight from certain localities and districts and turn it over to the liners for transoceanic carrying.

The second type of steam vessel is the tramp steamer which carries anything, anywhere. They are leased by their owners to merchants who have a freight large enough to fill them, and will carry this load direct to its destination. The movement of these tramp steamers is varied, and they try to manage their sailings so that they can pick up another load for some other port upon arrival at their first destination. These boats are built for freight service and can carry enormous loads. As is natural, the rates for carrying on these boats change constantly, as they depend upon many factors, such as scarcity of available transportation at the ports, the nature of the cargo to be carried, and the prospect of securing another load when they discharge at a foreign port.

Commercial sailing vessels are of two kinds. Square-rigged vessels, formerly used for long voyages, are fast disappearing because their operation requires a much larger crew than the schooner-rigged ship. This latter type is used almost wholly at the present time, as it can be handled with a smaller crew and, when equipped with a gas engine, is a practical carrier of certain kinds of merchandise. Barges, towed by tugs, are used extensively for coastal carrying of heavy freights like ore, coal, lumber, and oil.

Aerial Transportation. Aerial transportation is of three kinds. The aeroplane and hydroplane are alike in that they depend upon their wings and speed for suspension in the air, and differ only in their landing apparatus, the aeroplane landing on wheels on land, and the hydroplane landing on pontoons on water. The dirigible depends upon huge bags of hydrogen or helium gas for its suspension. Motive power for all three is supplied by propellers driven at tremendous speed.

The Wright brothers were the inventors of the heavier-than-air type of air transportation and Curtis has done much to develop it. The United States has originated many improvements in aviation but the European nations have made greater strides in air carrying.



(Photograph from Wide World Photos)

FIG. 30. A GIANT AEROPLANE
This aeroplane is capable of carrying twenty passengers and their baggage.

All over Europe regular air routes are in operation carrying mail, passengers, and light freights. Commercial aviation has grown slowly in this country, due to lack of organization and good landing fields. With the organization of the transcontinental air mail service, a start was made and gradually the air transportation of passengers and freight has become recognized as practical. The aeroplane has such a great speed that loads in which speed rather than cheapness, is important, give air transportation the preference. With the growth of commercial aviation has come governmental regulation to guard the safety of the aviator and the public in general.

TEXT QUESTIONS

1. Discuss the importance of inland navigation to commerce.
2. Show how rivers are a big asset in the carrying of freight.
3. What kind of freight is carried on inland rivers and canals? Why?
4. Show how railroads compete with inland canals and rivers.
5. Name and locate some of the important canals of our country.
6. Name and locate some of the important ship canals of the world.
7. Explain the difference between a sea level and a lock canal.
8. Discuss the importance of ocean navigation from early times.
9. Explain how improvements were made in boats.
10. Show the results of the competition between sail and steam power.
11. Describe the types of vessels now being used for commerce.
12. Describe the three kinds of air carriers. Explain the good points of each.

PROBLEMS AND PROJECTS

1. Have the class gather pictures of all types of transportation.
2. Explain how the transfer of freight across New York City is more costly than its transportation from Chicago to New York.
3. Tell why and in what ways the following kinds of transportation excel, giving an illustration in each case to prove your answer: Canal, ocean, railway, truck, horse-drawn, pack animal, human-drawn, human-carried, river, and air.

4. Good roads are admitted to be a good investment. Show how they affect the farmer. The city dweller. The automobilist. The manufacturer. The merchant. Commerce in general.
5. Why do we not build more good roads?
6. Why have railroad stocks fluctuated so greatly in value?
7. Explain the decrease in trolley mileage.
8. What country has the largest merchant marine? Why is ours not larger?
9. Why is water-borne transportation cheaper than land transportation?
10. Describe an aeroplane. A hydroplane. A dirigible. Which is best for commercial transportation? Why?
11. Draw a diagram and show how canal locks work.
12. On a map locate our principal inland waterways.

TOPICS

1. A brief history of the railroad growth in the United States.
2. The effect of the invention of the automobile on commerce.
3. Air transportation—its history and development.
4. The probable future of air transportation abroad. In United States.
5. Canal building in the United States.
6. The Panama Canal.
7. The great ship canals of the world and their effects on world commerce.

FOR CLASS DISCUSSION

1. The government should own and control the railroads.
2. Overland busses and trucks should be taxed more for use of the highways.
3. The Panama Canal should be tax free for all vessels.
4. Our merchant marine should be heavily subsidized.
5. The large navies of the world provoke war rather than encourage peace.

CHAPTER VI

LOCALIZATION OF INDUSTRIES

Division of Labor. One of the most important resultant factors of commerce and industry is the division of labor. This division of labor may take the form of geographical division of labor by regions, or it may take the form of industrial division of labor, or both. Division of labor is the basis of our present day commerce and at the same time it is also a result of commerce. Each is dependent on the other. It is better for a man, country and region to produce that which it is easier and more economical for them to produce, and to exchange the result with others who can more easily produce some other article, than it is for them to produce everything themselves to satisfy their wants.

An examination of our own economic situation will quickly reveal how dependent we all are on products produced by others, and how much better it is that we can specialize in producing something else to exchange. We should present sorry objects if we all tried to produce all of our necessities ourselves. In highly organized communities, this division of labor is greatly facilitated by perfecting the means of exchange of labor results through the medium of money. In this way we are not put to the necessity of constant barter, but can store up value by exchanging our labor for money, with which we can buy articles as we need them. A study of the division of labor is essential to a complete understanding of industry and commerce. This subject, because of its greatness, may be expanded indefinitely. We shall be able to present but a brief survey in this book.

Geographical Division of Labor. Some regions of the world are more favorably located to produce certain commodities of world commerce than are others. This results in a general geographical division of production, wherein the favored regions produce the commodities which are easier and more economical for them to produce. A logical result of this is the exchange of these commodities for the commodities of other regions, and so world trade becomes a necessity. The Orient can produce tea, silk, and rice more cheaply than other regions because of its immense amount of cheap labor. These articles are exchanged for the manufactured articles of the industrial regions of Europe and America, where industry and manufacturing are more profitable than the raising of the oriental products.

England, with her large population of industrial people, obtains her foodstuffs and other necessities in exchange for her manufactured articles. Brazil finds coffee growing profitable. We look to Germany for chemicals and fine scientific instruments, to France for the best silks, to the Mediterranean countries for olives, to South America for nitrates, to Australia for sheep and wool, to Sweden and Norway for lumber and minerals, and to our own country for cereals, cotton and copper. Russia specializes in growing foodstuffs and exchanges them for manufactured goods.

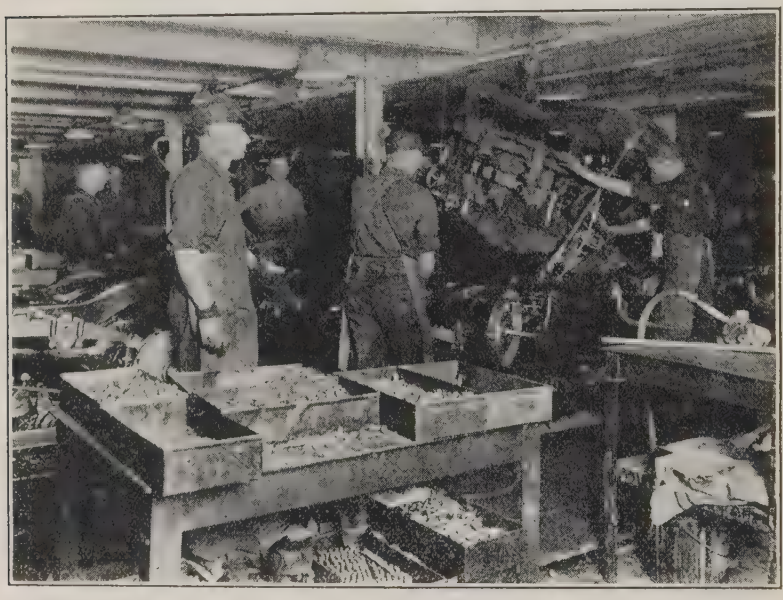
The number of illustrations of geographical distribution of production is unlimited, and a study of it will disclose an ever increasing tendency towards specialization in production. Within the confines of the countries themselves, we have a still further division of labor. In our country a few examples will illustrate this. California produces much of our fruit; our northwestern states, much lumber and salmon; our prairies furnish grazing for cattle; our corn belt specializes in livestock; cotton reigns supreme in the South; our Great Lakes area finds iron and manufacturing to be its specialty; our eastern states rely much on manufacturing for support; and New England is highly specialized in industrial lines.

Carrying this geographical division of production still further, we find a concentration of certain industries in a few cities which have become famous for their specialties. In England, we find the woolen industry centered at Leeds, the cutlery business at Sheffield, and the textile industry at Manchester. Lyons, in France, is known the world over as a great center of silk manufacturing. Essen, in Germany, specializes in iron and steel making. The flour mills of Budapest make that city famous.

In our own country, innumerable illustrations may be given. The meat packing industry finds Chicago its center. Brockton and Lynn specialize in boot and shoe making. Almost all the cameras are made at Rochester, New York. The area around Detroit is the great automobile-making district. Pittsburgh, Birmingham, and Gary are the steel centers. The collar and cuff industry centers itself around Troy, New York. Paterson is the principal silk manufacturing city. Minneapolis is the largest flour milling city in the world. East Liverpool, Ohio, and Trenton, New Jersey, control the pottery industry in this country. Waltham, Massachusetts, and Elgin, Illinois, are noted for their watch making. So important is this concentration of industries in certain cities that we shall study the causes of it more in detail and discover why it occurs.

Industrial Division of Labor. Within the industries themselves we also find a high degree of division of labor. This takes the form of specialized factories and specialized operations. In Detroit, we find a high concentration of the automobile industry. In this city, we find many factories specializing in the making of certain parts and accessories, while other factories specialize in assembling these parts. Within the factories themselves we find the labor so organized that the workers become highly skilled in some one operation. The enormous output of the Ford factory is possible because of the highly organized process of production wherein each man does one simple operation quickly.

In Lynn, Massachusetts, we find a high concentration of the shoe industry. Several factories are found here, each manufacturing only certain parts of the shoe. In these factories are skilled workers specially trained to only one operation. In the meat-packing industry at Chicago, a trip through the establishments will show how each worker does one simple operation at which he becomes extremely proficient, and how this division of labor greatly speeds up the output and increases the total efficiency of the plants. In some isolated situations it may be better to be a jack-at-all-trades, but in our economic life at present it is necessary for the worker to be highly trained along some special line and to be a master of it.



(Photograph from Wide World Photos)

FIG. 31. DIVISION OF LABOR IN A MOTOR CAR PLANT
Nowhere is division of labor better illustrated than in the automobile industry where each man does only one operation.

This industrial division of labor has its bad effects as well as its good points. It tends to make the wage earners more dependent on one specialty only, and also makes the work less interesting because of the monotony of doing the same thing over and over again.

The whole tendency in our modern industrial system is towards specialization and division of labor. Our whole educational system with its various courses and kinds of schools is founded on this principle. Young people will do well to consider carefully just how they can fit into this division of labor and the work that is best fitted for them.

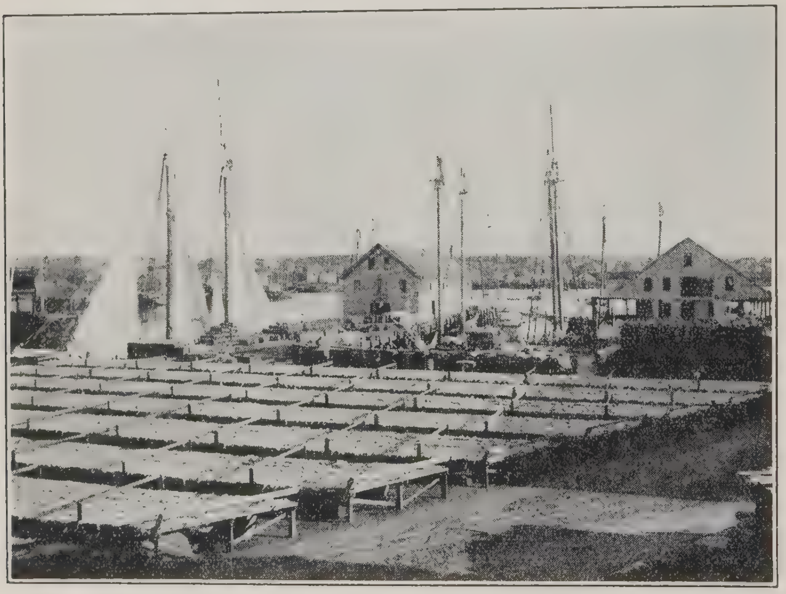
So great is the economic cost of misfits, resulting in a greater labor turnover, that stricter attention is being given to the importance of expert vocational guidance and advice, enabling young people to find the work for which they are best fitted without the waste of time and loss of money which follows the hit-or-miss way.

Concentration of Industries. The study of commercial products will show us the general facts about the geographical division of labor. The causes of concentration and localization of industries in certain regions and cities will now be taken up. Dr. Hall, a writer in the Twelfth Census, has ably organized the causes of this localization as follows:

1. Nearness to raw materials
2. Nearness to markets
3. Climate
4. Power supply
5. Labor supply
6. Capital supply
7. Momentum of an early start

In applying these causes to specific cases we shall find that all but the last one affect the general location of an industry with regard to a region, while the last one determines the exact city. In some instances, several of these causes enter into the determination of the location, while in others one or two causes are dominant. So complex is modern industry that oftentimes it is impossible to determine the exact relative value of the causes. These causes vary in their strength at different stages of the industry and other factors may enter into the situation. In considering the first two causes above, nearness may be taken to mean accessibility because oftentimes the geographical distance is not a fair gauge of accessibility, especially in the presence or absence of excellent transportation facilities.

Nearness to Raw Materials. In general, industries dealing with bulky or perishable raw materials are located as near to the source of their raw materials as possible. The sweet corn canning industry is located in New York and Maine near the sweet corn fields. The fruit canning factories are situated in California. Baltimore leads in canning oysters and vegetables which are supplied from its nearby oyster beds and vegetable gardens.



(U. S. Department of Commerce)

FIG. 32. DRYING COD, GLOUCESTER

The canning of salmon is carried on in the Northwest where salmon are numerous. The salt cod industry is located at Gloucester where the fishing boats unload. Logs are cut into boards as near the forest as possible, oftentimes portable saw mills penetrating the woods themselves. Because of their bulk, logs cost much more to transport than boards and shingles. The paper pulp industry is located near the forests of New England and New York where the raw material is converted into pulp, which later may be made into paper nearer the markets.

Originally the tanning industry was located in the east near the supply of tan bark. As the supply of tan bark decreased, this industry moved westward nearer a new supply and also nearer the meat packing centers from which it secured the hides. Many of the tanneries, however, are still located in the East because modern methods and the use of concentrated and mineral tanning reagents have decreased the transportation costs to a point where it is not profitable to scrap the established factories and lose the benefits of the capital invested.

The manufacture of carriages and wagons found a favorable location near the hardwood forests of Ohio, Indiana, Illinois, and Michigan. Later these factories turned to the manufacture of automobiles because their location was favorable on account of the raw iron and hardwood near at hand. The same influences centered the manufacturing of agricultural implements in the same general region. This was aided by the fact that this region was also near the great agricultural districts where the market was located.

Because of the presence of coal, iron, and limestone, the iron and steel industry naturally located at Pittsburgh. Later the opening of the Mesabi district and its cheap iron ore expanded the region of this industry to the area around the Great Lakes. Birmingham is especially favored in its nearness to the raw materials of limestone, iron ore, and coal. The making of clay products was located at Trenton and East Liverpool because of the presence of clay and fuel. Later the importance of the clay deposits ceased to be a controlling factor, owing to an unusual chance to secure cheap clay from abroad because of the demand for return loads from abroad in ocean transportation.

Many of the flour-milling cities of New York began this specialization in days when New York was the leading wheat state. The relatively cheap transportation of the raw materials across the Great Lakes enables these New York cities to still maintain their mills even though at some distance from the raw material. Minneapolis was at first a great center for saw mills, because of the water power at hand and the nearness to the forests. As the supply of wood decreased and the amount of wheat growing in this region increased, this city changed to flour milling.

Nearness to Markets. The greatest concentration of industrial activity is found near the markets and areas of dense populations which provide the markets. Many industries found their location when almost the whole population, and hence the market, was in the East. It is true that as the center of population has moved westward, the center of manufacturing has also moved westward somewhat. The East still retains its industries, not only because of its proximity to the large markets of the East, but also because of its relative nearness to the ever increasing European markets. Pittsburgh is very well situated in comparison with other steel centers, in this respect, being able to ship its great iron and steel products to the markets of the East and also to Europe more easily than cities further removed.

Whenever the raw material is perishable, it must find a market near at hand. This accounts for the large milk industry of New England. Bulky, finished articles can be manufactured near the markets to advantage. The location of the agricultural machinery industry in and near Chicago is explained by the nearness of the market and also nearness to the raw materials entering into this kind of manufacture.

Favorable location near the eastern and European markets has enabled New England to hold its industries in spite of the fact that she is not near the raw materials. As the population in our West grows more dense and the markets improve, new factories will more frequently move westward to be near these markets. The manufacture of shoes in St. Louis is growing because of the increasing market in the West.

The relative importance of nearness to raw materials and nearness to markets depends much on the nature of the article manufactured. The manufacturer of small, expensive articles is more independent of either than is the manufacturer of large, bulky, or perishable articles. Older established industries must also take into consideration the amount of capital invested in plants. They are therefore more fixed and less able to follow the changes of either factor.

Climate. In another chapter, we have already studied the general effects of climate on people and we found that the more energetic and capable people are located in the temperate zone where conditions favor health. This explains, somewhat, the location of our industries in the northern section of our country where the climate is invigorating. Most of the skilled workers are accustomed to the northern climate and it is difficult to persuade them to migrate to warmer climates. New England still continues to make the finer grades of textiles because of her highly skilled operatives who prefer her climate to that of the warmer South. For this reason only the coarser grades of cotton goods are made in the South.

Climate has a direct influence on some industries. The dried fruit industry in California finds an ideal location near the fruit and has the advantages of a good drying sun and air. The makers of moving pictures have found the climate of California well adapted to the taking of pictures and have centered this industry at Hollywood. The moist climate of England is ideal for certain processes in the making of textiles. New England found certain cities well adapted for textile making because of the moisture in the air. Where this moisture is not present, artificial means of preparing it and filling the rooms with it have been invented. The region around the Finger Lakes of New York is preferred for growing grapes because of its peculiar adaptability due to the climatic conditions which prevent early destructive frosts in the spring and fall.

Power Supply. Power is essential to manufacturing and industry. Water power and steam power from coal are the two great power agents. Electricity, when used, is a product of these two. Petroleum and natural gas as permanent sources in manufacturing occupy a small place. New England took advantage of her water power resources and early became a manufacturing section. When coal became more economical in manufacturing, she seized upon it to maintain and increase her factories.

The leading manufacturing regions of the world are located near some source of power, either water or coal. This explains the industrial character of England, Germany, France, and the United States. Our eastern and central sections are exceptionally well situated in relation to power sources. The short, sharp fall of our eastern rivers and the location of the fall line so near the ocean, coupled with the presence of extensive coal deposits which are easily accessible, make manufacturing possible and desirable on our Atlantic seaboard.

The coal deposits and iron ores make our central northern section around the Great Lakes ideally located for the manufacture of all commodities requiring iron and steel. Our country has rapidly forged ahead in industry, not only because she is generously endowed with abundant raw materials but also because of her water power and easily worked coal deposits. Because of the former we find many of our early industries located at water power sites at the falls of our rivers. The use of coal removed this necessity of location and spread the location of industry so that many of the later industrial cities ignored the factor of water power in their industrial growth. The use of electricity, transmitted long distances, will decrease the necessity of locating near a direct power supply.

Labor Supply. Industries, with many years of success behind them, naturally draw to them many skilled workers, and gradually a community where industry has become highly specialized finds itself with a large body of workmen highly trained in the particular lines required in the dominating industry. When a new factory along the same line is being projected, it is natural for it to be located where success has attended previous installations and where there will be found a plentiful supply of skilled workers in the industry. Cities like Elgin and Waltham have built up a reputation for fine watch making. It is logical therefore that these cities should have a large number of skilled watchmakers and workers along this line. Because of this number of skilled workmen, a new watch factory would find it advantageous to locate in one of these cities.

Industries in general prefer to locate in a region of dense population where a steady supply of labor is available. In New York we find a concentration in the clothing industry due to the presence of large numbers of workers, recruited largely from the immigrant classes. Chicago attracts industries because of the large numbers of workers available. The textile cities of New England are filled with operatives skilled in textile manufacturing, and in such a highly specialized industry this large number is necessary. The same is true of the shoe industry. In and around Pittsburgh we find hundreds of workers trained in the iron and steel industry. A manufacturer seeking to locate a new factory will study the labor situation carefully, and if the industry is a specialized industry requiring many different kinds of skilled workers, he will naturally locate in a place where the supply is at hand, in a city specializing in the industry.

Capital Supply. The highly organized industry of today demands and requires a large amount of money to run its plants, to erect new ones, to pay wages, to buy raw materials, and to finance its production. This money is called capital. Wherever there is capital free to support it, manufacturing will grow. Sometimes an industry has begun in a small way in a small community. It succeeds, and the townspeople invest more of their capital in this home concern where they can feel reasonably secure it will be profitable. As the industry grows, other industries are attracted to the locality and are financed either by local funds or capital from outside.

Outside capital is easier to secure after local funds have built up a successful industry. Large capitalists are more willing to risk their money in a business where conditions have already demonstrated that the situation is favorable to success. It is interesting to note that the surplus savings of the people of the eastern section of our country are invested in industrial concerns near home, while the savings of the people in our western section naturally go into the expansion of agriculture.

The present system of corporation organization facilitates the building up of huge amounts of capital for investment in industry by permitting the ownership of small amounts of stock by all classes of people. The capital supply of one of our largest railroad systems has been furnished by the selling of stock to over twenty thousand investors and stockholders, many of whom own but small amounts. Some corporations encourage their own employees to invest their savings in the stock of the company and thus bring added capital to the company and also an added interest in it to their employees. The presence of large amounts of capital in the East and Middle West accounts for the location of several industries.

Momentum of an Early Start. Just why some particular city or town has become the center of some industry, rather than any other city nearby, is due generally to some peculiar circumstances at the beginning of the industry.

Perhaps some man had special skill or training in the making of some article and so soon made a name for himself and drew others interested in the same line to the same town, in order to avail themselves of the fame thus acquired. Lynn acquired its fame as a shoe city in Colonial times, through the skill of a shoemaker named Dagyr who excelled in making fine shoes. It quickly became known that excellent shoes could be obtained in Lynn, and this knowledge attracted other shoe makers to Lynn to participate in the profits that the fame supplied.

Possibly some band of immigrants especially skilled in some line of work settled in a town and began to ply their trade so well that there sprang up a demand for the products. Competitors moved to the town to gain the benefit of this reputation, and so the town grew and with it the industry. Gloversville and Johnstown in New York were settled in this manner by expert glove makers and these towns now are the center of the glove trade. A man by the name of Lowell brought over from England a skill in textile making. He began making textiles at first in Waltham and later in Lowell, Massachusetts. From this beginning have come the factories engaged in the textile industry at Lowell.

The collar and cuff industry localized at Troy, New York, because there someone invented the detachable collar and cuff. These soon came into popular use and the industry, started at Troy, grew rapidly there. The camera making industry is centered at Rochester, New York, principally because of the success of the first factories there.

TEXT QUESTIONS

1. Explain industrial and geographical division of labor.
2. Show how modern commerce is dependent upon division of labor.
3. Discuss geographical division of labor, giving illustrations.
4. Show how geographical division of labor may be carried to cities and states. Illustrate each case.
5. Describe industrial division of labor. Give its good and bad points.
6. Give the principal causes of concentration of industries.
7. Show how these vary in importance in different cases.
8. Discuss "nearness to raw materials," using illustrations.
9. Explain the importance of being near to markets. Illustrate.
10. Show how the nature of the article manufactured influences the location of its industry. Illustrate.
11. Prove that climate has a direct bearing on localization of industry. Illustrate.
12. Discuss the importance of power supply in locating industry. Illustrate.
13. Explain the rising importance of the Middle West in manufacturing.
14. Why did New England early become industrial? Why has it remained so?
15. Illustrate the necessity of a constant and skilled labor supply.
16. Show how our system of supplying capital tends to concentrate industries in certain localities. Illustrate.
17. Explain how an early start has been an important factor in the concentration of industries. Illustrate.

18. Which of the above causes tend to locate an industry within a certain territory? Which tend to locate it at a certain point? Prove your answers.

PROBLEMS AND PROJECTS

1. From your own locality give an illustration of industrial division of labor. Of geographical division of labor.
2. Is it better for a man to be a jack-at-all-trades or the master of one (1) in an isolated situation, (2) in a dense population? Prove your answer.
3. Show industrial division of labor and geographical division of labor as applied to one important industry in the United States.
4. Apply the reasons for concentration of industries to the following cities, listing them in order of their importance by number. Be able to locate the cities on a map.
    1. Nearness to raw materials
    2. Nearness to markets
    3. Favorable climate
    4. Labor supply
    5. Power supply
    6. Capital supply
    7. Momentum of an early start

Minneapolis—flour
Buffalo—flour
Niagara Falls—flour
Lowell—textiles
Manchester—textiles
Lawrence—textiles
Pittsburgh—iron and steel
Birmingham—iron and steel
Gary—iron and steel
Bath—wooden ships
Grand Rapids—furniture
Boston—wool
Butte—copper
Detroit—automobiles
Dayton—cash registers
New York—clothing
Lynn—shoes
Brockton—shoes
Haverhill—slippers
Gloversville—gloves
Johnstown—gloves
Troy—collars
Glen Falls—collars
Rochester—cameras
Chicago—implements
New London—hardware
Trenton—pottery
New Orleans—molasses
Omaha—meat
Waltham—watches
Elgin—watches
Philadelphia—textiles

5. Illustrate concentration of industries in Europe. Give reasons.
6. Show how transportation tends to spread industries.
7. Why does not the center of industry move westward equally with the center of population?
8. Discuss the probable effect on industry if our country had been settled from the Pacific Coast eastward instead of from the Atlantic coast westward.
9. Why must the eastern states retain their industrial leadership to survive?

TOPICS

1. The history of the glove industry at Gloversville, N. Y.
2. The origin and rise of industry in New England.
3. The effect of the Mesabi district iron on the lake states.
4. The effect of the Great Lakes and the Erie Canal on the industries of New York.
5. The increase of cotton manufacturing in the South.
6. The westward expansion of industry.
7. The importance of power in industry.

FOR CLASS DISCUSSION

1. New England is slipping industrially.
2. Concentration of industry is not beneficial to the country as a whole.
3. A high degree of specialization in industry is against the interests of labor.
4. Each country should not strive to be self-sufficient but should produce those things for world commerce for which it is best adapted.
5. Chance has played the most important part in the localization of most of our industries.

CHAPTER VII

THE GROWTH OF LARGE CITIES

The Growth of Large Cities. The growth of cities is a very important resultant factor of commerce and industry. The expansion of trade to world dimensions during the past one hundred years has been attended by an unparalleled growth of our cities. The great cities of the world today would be impossible without the highly organized trade of the present time. The cities must, of necessity, depend upon commerce to supply the enormous demands of their great populations. Trade in turn must look to the centers of industry and commerce to supply the needed commodities of trade, to provide the organization for distribution, and to furnish a market. Thus the cities create industry and commerce and also depend upon these two for continued existence and growth.

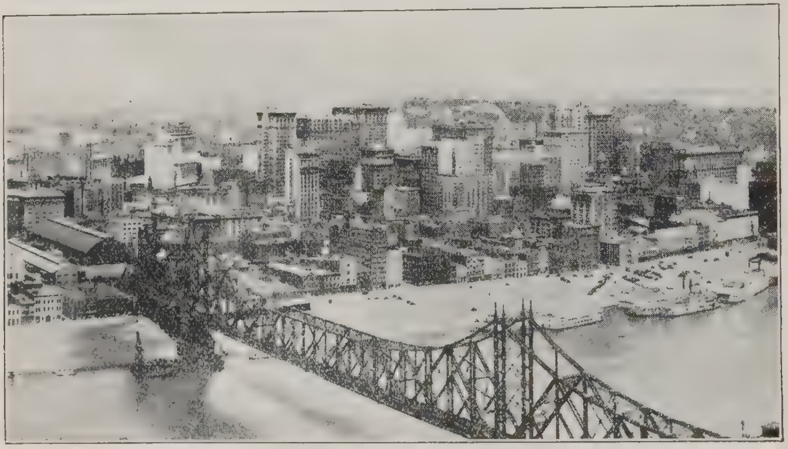
In examining the factors which enter into the origin and growth of cities, we find oftentimes that the original reasons for the location of a city have been replaced by other factors, notably factors involving industry and commerce. Some factors which had much weight formerly are now unimportant, while others have become dominant. In some cases, we are able to classify cities as distinctly commercial, while others are found to be more industrial in their nature. Some are important both commercially and industrially. A brief glance at history shows that many cities that were formerly great trade centers are now fallen into decay, while others have grown to be of great commercial importance. While the reasons for the rise and fall of cities are varied, the principal cause is found in the flow of trade.

Suitable Site. It seems perfectly obvious that in order to become a large city, a small one must have a suitable local site for its expansion. Some great cities, not anticipating their future, paid but little, if any, attention to the site at their beginning, but lack of this attention has been costly in subsequent developments. Galveston started on a very poor site but has overcome this handicap at a great cost. Cities which started on a place where expansion became easily possible have grown that much easier and at less cost. Some places can never become great cities because of certain limiting physical factors in their local sites like swamps, mountains, and other impassable barriers to continued growth.

Hinterland. The surrounding region, called the hinterland, is an important factor in the growth of cities. In order to support a large city, there must be a nearby region from which products for commerce and industry can be drawn. These hinterlands may contribute to more than one city, but no city can become a commercial center without a region to draw upon. Sometimes this nearby hinterland is sufficient to furnish all the products necessary for commerce of the city. In other cases, the city may reach out beyond the nearby region to other regions which transportation makes accessible for its commerce. Thus New York has a rich region all around it, but reaches still further, through the Erie Canal and the Great Lakes and by means of the railroads, to gather the articles of its commerce even from the middle western areas. Boston is not content with trading in the articles which come to it from its neighborhood but reaches out through all New England for its commodities. New Orleans draws on the whole Mississippi Valley.

Political Causes. Many cities owe their origin to the fact that they became the seat of government and, as the capital city, secured advantages over less favored cities. This cause was more important in olden times than it is now. Formerly, the protection afforded by government played a necessary part in life, and trade was secondary to it. Many of these political cities, however, became natural centers of trade, and so grew beyond the bounds of political needs. Rome and Athens illustrate this type of origin in ancient times. In more recent times we find cities which have grown to large proportions from a political start.

Washington was made the capital city of our country, and drew to itself a population of law makers and governmental employees. Favorable factors have increased this population beyond governmental workers. Many of our state capitals would be small towns had they not been made the seats of government. Some of them have become great cities, because, in addition to their political origin, they possessed other factors which made for commerce and industry. These advantages have made St. Paul, Indianapolis, Albany, and many other capital cities, the large cities that they are.



(Photograph by Ewing Galloway, N. Y.)

FIG. 33. SKYLINE, PITTSBURGH, PA.

Some cities find their start in the fact that they had a favorable location for a military stronghold or fort. A few of these cities have kept to their original purpose, but by far the greater number have outgrown it and have become mighty cities of commerce because of other favorable circumstances. Pittsburgh was at first a frontier post. Its proximity to raw materials and its wonderful transportation facilities soon made it grow into one of the leading industrial cities. Its military function has disappeared entirely. Detroit is another illustration. Chicago, Quebec, Paris, London, and many old cities of England had their origin in the fact that they possessed a location favorable for protection.

On the other hand, some of the earlier cities, prominent because of their military location, have declined due to the decline of their importance as strongholds and because they did not have advantages to favor the flow of trade. Rome no longer holds its position among cities. Athens is comparatively insignificant today. Jerusalem has passed into the small city class.

It is interesting to note here that many of the cities whose origin may be traced to military and defense reasons would fare badly as strongholds today under the present methods of warfare. It has been said that none of our great cities at the present time would be chosen as sites for defensive positions. Commercial methods and the decline of the importance of former military methods make the founding of cities for protection purposes of little or no importance today. This factor has played an important part in the past but has little if any value at present. Only where the making of cannon, munitions or warships is carried on, is it of any influence.

Closely allied to the preceding factor is another. Several cities began as colonies of some mother country. History is full of examples of the establishment of such colonies. These colonies centered around some location which eventually became a city, gradually shaking off its status as a colony and becoming a city in its own right. Carthage was started as a Phoenician colony. Marseilles was a Greek colony. San Francisco was founded by the Spanish. New York was settled by the Dutch. Quebec and Montreal started under the French as colonies.

One other phase of political power has influenced the growth of cities and that is the collection of custom duties. In places where the custom frontiers are close together and the barriers frequent, these seats of custom collection are not, as a rule, large cities. In countries where the boundaries are further apart, like the United States, the concentrating of custom collections into a few large seaports influences the growth of these ports of entry by causing the stream of imports to flow through them for inspection and levy.

Transportation Facilities. The commerce of today and, through it, our industry, depend upon the rapid, easy, and cheap transportation of commodities. It is perfectly natural, therefore, that sites which are favored in the matter of transportation should become important commercial and industrial centers, rather than locations less favored. History shows that cities which can not maintain equality with other cities in transportation facilities, are eventually unable to hold their place in competition. A shift in trade routes, due to a change in transportation facilities, has often resulted in ruin to some cities. The discovery of an all-water route to India, coupled with the discovery of America, brought about a great increase in water transportation and a decrease in overland transportation, with the result that the Italian cities of Venice and Genoa and their dependent allied cities on the overland routes lost their prestige, while the seaports of the Atlantic grew in power.

The coming of railroad transportation in our country, with a corresponding decline in canal and river transportation had somewhat of a similar effect on some of our cities. The change from small sailing vessels to large steamships during the last part of the last century increased the growth of the cities having the deeper and better harbors, to the injury of the cities with shallow harbors. So important a place does transportation play in the growth of cities that a more detailed study of its effects is justified.

Land Transportation Facilities. Some locations are favored in being the natural topographical centers of districts. Cities grow up at the junction of valleys and at the end of mountain passes, because trade naturally follows through these channels. In primitive conditions where trails crossed we found towns arising which later became cities. The great caravan cities of ancient times depended in large part for their prosperity on the fact that they were the places where caravan routes crossed or ended.

A place where the method of carriage changes is a favored location. The spot where it is necessary to break loads and repack, often becomes a city. Places located where pack animals begin their transportation of merchandise form good sites for towns or cities. Where camels begin their desert routes and take on their loads, we may expect a town or city. A location where water transportation stops and land transportation begins is the best location of all for a city. Where land transportation is interrupted by rivers, necessitating a bridge, ford, or ferry, has been chosen for the site of some towns, which may later grow into city size. The names of many of our cities indicate clearly that this cause was prominent in their origin.

The most important mode of land transportation now is the railroad. To it many cities owe their continued growth and prosperity. The cities on the Mississippi River looked to the river for their transportation until the coming of the railroad which has continued their growth by increased and superior transportation facilities. As a rule, the railroads have found it to be advantageous to build their lines to cities already in existence rather than to create new cities. However, some cities have been greatly aided by being the junction of railroads or the place where they end. Indianapolis owes its growth in large part to the fact that it is a junction of several trunk lines. Chicago is favored in being the terminal of several roads.

The wonderful organization of our railroads today with their mechanical perfection, their facilities for loading and unloading, their well-laid tracks and superior equipment, accounts in large part for our ability to compete in the European markets. Our raw materials from the interior of the country are pulled over the long hauls to our seaports at such a low rate that our farmers are enabled to market their crops at a profitable price.

Water Transportation Facilities. Up to the coming of the railroads, a favorable location along the inland rivers was a more important factor in the growth of our inland cities than it is at present. Formerly, water transportation on the rivers was the easiest, quickest, and cheapest way of transporting goods. A site where this river transportation was interrupted by falls was particularly desired. The falls caused a break and made necessary a trans-shipment of goods and so more men were demanded.

The place where navigation of the river started was also favored because here, too, a break in cargo occurred. Some cities grew on well selected locations on certain large bodies of water, like the Great Lakes. Duluth, Buffalo, Chicago, and Cleveland found this situation greatly to their advantage. Where navigable rivers and good harbors are found together is the best location of all.

(Keystone View Company, Inc., N. Y.)

FIG. 34. CHICAGO IN 1840
The location of Chicago on the Great Lakes favored its growth.

Because of the increased draught of vessels the larger seaports with the better harbors have steadily grown. The last one hundred years have seen a tremendous growth in the great natural seaports of the world, and a corresponding decrease in the inferior competing ports. Our seaports have grown fewer and larger. Some of these seaports are occupied chiefly with an export trade, while others, because of their hinterland, form the neck of the bottle through which flows a mighty stream of exports and imports.

Artificial Transportation Facilities. The influence of man is seen in the growth of some of the large cities. This influence has been shown principally in the creation of artificial means of transportation which have in turn influenced the cities. The construction of the great ocean canals like the Panama Canal, the Suez Canal, and the Soo Canals has changed the flow of commerce and determined the growth of some cities and the decay of others. The Suez Canal stimulated the lagging commerce of the Mediterranean cities. The Panama Canal has stimulated the seaports on our eastern and western coasts. The Soo Canals made possible the huge ore loads which have built up the middle west cities. The Erie Canal shifted the commerce coming from the west towards New York City. The inland canals carry great loads of slow freight and influence the cities to which they go.

(Photograph by Ewing Galloway, N. Y.)

FIG. 35. ALBANY, N. Y.
The Erie Canal aided the growth of Albany at its eastern terminus.

The building of bridges across rivers has caused the growth of some cities. The dredging of channels and harbors affects the cities which need this help. The cities which have taken action to provide improved facilities for docks like the Bush Terminals in New York reap a harvest in increased growth. Wherever some defect in transportation facilities exists, it is to the interest of the city affected to overcome the defect if it wishes to continue to grow in the strenuous competition today between cities.

Social Causes. Religion caused the rise of some towns which later became cities because of the people attracted to them and the necessity of trade to supply them. Jerusalem was the religious center of the ancient Hebrews. Mecca drew large multitudes of believers and pilgrims. Lourdes became famous for its religious atmosphere. Ste. Anne de Beaupre in Canada attracts thousands annually. Rome has maintained its status as a city because it is the home of the Pope and the head city of a great religion.

(Keystone View Company, Inc., N. Y.)

FIG. 36. ROME
Rome is the head of a great religion.

Other cities have become famous for educational facilities. Oxford in England and Cambridge in Massachusetts look to their great educational institutions as one of the factors in their origin and growth. Among the chief attractions of Paris are its wonderful museums of art which are visited annually by thousands of tourists.

Manufacturing Conditions. It goes without saying that our cities depend much upon industry. The factors upon which industrial cities depend have already been discussed in detail in a previous chapter. These factors must be present if the city looks to industry, in any degree of importance, to maintain itself. Many cities began as industrial cities and have continued their growth along this line, looking to commerce only to provide the necessary means of disposing of the manufactured articles, and to supply the demands of the population. Other cities, which depend almost wholly on commerce for their growth, need not depend upon industrial factors so much.

Industry predominates in most of our middle sized cities while commerce generally is of major importance in our larger cities. We find some of our large cities, however, notably Philadelphia and Chicago, where manufacturing outranks commerce. It is obvious that even when commerce is the principal interest of a city, it can not grow to be a great city unless industry is also present to support its great population. There are some cities, like Galveston and Santos, where commerce in exports from their hinterland is the principal interest of the city. These cities can never attain to greatness under these circumstances. The greatest cities combine both industry and commerce within their bounds and have facilities for both to maintain their great populations. Where conditions are favorable to both, inevitably a great city will arise.

TEXT QUESTIONS

1. Show how the growth of large cities is a factor and also a result of commerce and industry.
2. What is the principal cause of the rise and fall of commercial centers?
3. Name three ways in which political causes affect the growth of cities.
4. Discuss the political origin of cities as seats of government. Illustrate.
5. Why are not all capital cities commercial centers? Illustrate.
6. Explain the importance of military strongholds as commercial centers in the past. At present. Illustrate.
7. Illustrate and show how many cities arose as colonies.
8. Outline the importance of good transportation facilities in the origin and growth of cities. Illustrate.

9. Discuss the importance of land transportation facilities. Illustrate.
10. Why is a place where a break in transportation is necessary, favorable to the location of a city? Illustrate.
11. Show how the cities on the Mississippi River changed from river transportation to railroad transportation.
12. Show how railroads can make or break a locality.
13. In water transportation, what sites are the most favored? Why?
14. Why have our deeper harbors grown to the detriment of our poorer ones in the last fifty years? Illustrate.
15. Make a list of some of the artificial transportation facilities which have influenced commerce greatly.
16. Show how some localities have built up their commerce by artificial transportation facilities.
17. Discuss the influence of religious centers on commerce and the rise of commercial centers.
18. Illustrate the effect of educational institutions on some cities.
19. Why is it not possible for a city to become great unless there is some industrial life present to supplement commerce?
20. Illustrate cities that are primarily commercial.

PROBLEMS AND PROJECTS

1. Explain the fall and loss of prestige of the following cities:

   Jerusalem
   Rome
   Alexandria
   Babylon
   Athens
   Carthage
   Nuremburg
   Florence

2. Explain the origin and growth of the largest city in your state.
3. Show how man sometimes has laid the foundation of a great city ignoring the above causes. Illustrate.
4. Illustrate how some cities grow prosperous in trading in the articles produced by other cities.
5. Illustrate how some cities depend upon other cities to market the products of their industry.

6. Apply these causes of growth to the following cities. Use the number preceding each cause. Arrange the causes in order of importance in each case. Be able to locate each city mentioned.

    1. Suitable site
    2. Land transportation facilities
    3. Inland water transportation facilities
    4. Good harbor
    5. Manufacturing conditions
    6. Social conditions
    7. Political causes
    8. Hinterland or surrounding region

New York 1
Philadelphia 3
Buffalo 3
Pittsburgh 3
San Francisco
New Orleans 4
Minneapolis 3
St. Paul
Rochester 3
Portland, Ore. 1
Portland, Me. 1
Washington 3
Syracuse 2
Ann Arbor
Cleveland
Springfield, Mass.
Boston 1
Memphis
Albany 3
Chicago 3
Detroit 3
Hartford
Seattle 3
Galveston 1
Los Angeles
Cambridge
Salt Lake City
Bangor
Amherst, Mass.
Kansas City
Princeton
Baltimore
Quebec 3
Montreal
Providence

Paris 3
London 1
Constantinople 3
Manchester
Genoa 1
Shanghai 3
Berlin
Liverpool
Calcutta

7. Select one of the above causes of growth. Prove that it is the most important cause of all in the growth of commercial cities.
8. Which of the above causes of growth are perpetual? Which are temporary? Give reasons for your answers.
9. Make a list of five cities primarily industrial. A list of five cities primarily commercial.

TOPICS

1. The effect of the shifting of the trade routes on commercial cities during the fifteenth and sixteenth centuries.
2. A historical sketch involving the causes of the growth of some large city like New York, Chicago, Philadelphia, Boston, San Francisco or New Orleans.
3. The decline of the importance of protective features in locating a city.
4. The necessity of good transportation facilities.
5. The importance of a good hinterland.
6. Political cities of America.
7. College cities of America.
8. The problems of the large cities.
9. The effects of our large cities.
10. The future growth of our large cities.

FOR CLASS DISCUSSION

1. More great men have come from the country than from the city.
2. Large cities are dangerous to our form of government.
3. Rural life has more advantages than city life.
4. The country boy is better fitted for life than the city boy.
5. Great cities constitute a menace to the welfare of mankind.
6. Competition between cities is uneconomic.
7. Efficient administration of government in large cities is impossible under conditions which prevail in them.
8. The Golden Rule is practical in the business of our large cities.
9. The political rights of our large cities are not sufficiently protected in our legislatures.
10. Larger cities are desirable.

CHAPTER VIII

THE USE OF POWER RESOURCES

Growth of the Use of Power. The first power used by man was that of his own strength. For centuries he depended wholly upon this to supply his needs. Then he used conquered slaves to do his more disagreeable work. Animals were gradually trained by the more enlightened people to do the heavy and more arduous labor and thus lighten man's burden. We find evidences of human and animal power far back in history. Ancient ships were propelled against the wind by galley slaves. The Pyramids were built by human labor. Samson put his great strength to use in captivity by turning the sweeps of a stone mill. Eventually man discovered how to harness the wind and propel his boats by its power. This led to the use of wind mills, and water wheels followed in course. We know the Romans used the water wheel as a source of power, and water wheels were in use in England as early as William the Conqueror. Wind mills were a common sight in the landscapes of old Europe.

But it was the discovery of steam as a power source that made the rapid mechanical advance in the last century. Beginning with the Industrial Revolution in England, the use of machinery to do our work grew in great strides until today the work done by the various kinds of machine power in the United States alone is equal to the work done by three billion slaves, or an average of thirty slaves to each person now living here. We are now living in what is justly called the Machine Age, and so accustomed to the use of machinery are we that it is difficult for us to understand the labor conditions preceding this era. The expansion of mechanical energy and invention is still going on and the future promises much more growth.

Importance of Power Resources. So dependent are we upon machines and the power that runs them, that a stoppage of the power supply would throw society and our present civilization into chaos. The social structure we have reared on coal power alone would topple and fall if that commodity should give out. The mighty increase in the world's population and its maintenance through world commerce have been made possible by steam driven machinery. We are now so placed that even the necessities of life depend upon mechanical agencies for their production and distribution. The mighty avenues of transportation throughout the world are maintained almost wholly by machines.

With this machine age has also come a liberation of man from much of the drudgery and mean jobs of life. So also has come a corresponding advance in man's economic status. With this increased standard of living, we find men less and less inclined to the dirty and hard work necessary and a growing inclination to thus throw more and more of a burden upon mechanical power. With this growing demand comes also a greater drain upon our power resources. Our power supply must keep pace with our indutrial demands or our whole social and economic fabric will be in danger, and our present civilization will fall. It is of the highest importance, then, that we look to our power resources and examine as to whether we are intelligently using them or foolishly wasting them.

SECTION 1—COAL

Use of Coal for Power Recent. Coal has been used in China for centuries, but only for heating purposes. For several hundred years England has used her coal for heating houses and for smelting purposes. The use of coal as a steam-maker, and so as a source of power, is of comparatively recent origin in the world's history, dating from the Industrial Revolution in England, which was brought about by the discovery of the use of steam. England, with her lack of wood supply, naturally seized at once upon coal as a fuel to make steam for power, and being a well settled and naturally industrial nation, soon led all other nations in its use.

England's use of coal for steam power antedated our use of it for the same purpose by almost two hundred years. In this country we were busy settling our country and our population was expanding at a very rapid rate. Our first sources of power were wood and water power which were much more abundant here. It was not until 1870 that we began to use coal for power purposes. For a while water power was sufficient for our needs and many of the leading industrial centers were built on water power. The water power locations were not, however, always the best, and the supply of water was irregular.

Coal permitted a greater choice of location and also provided a regular supply of power at all seasons. Thus coal soon passed water power until today over eighty per cent of our power is derived from coal and only about sixteen per cent is taken from water power. The improvements in transmission of hydro-electric power and the storing of large amounts of reserve water are beginning to bring back water power to a more important position. While some of the power of our large manufacturing cities located near good water power is still derived from it, even in those cities coal is used to supplement it in time of low water.

Extent of Coal Deposits. It is estimated that we have at present about 500,000 square miles underlaid with coal of varying grades and ease of extraction. This is about one-half of the known world supply. There are important deposits of coal in England and in Europe. Large deposits are found in China, but are as yet practically untouched. Japan's supply is limited, but she is using it in her industries. So far, coal in large deposits has not been found in Africa or in South America. The tropics, in general, lack coal.

The coal production of Pennsylvania alone is greater than all of the rest of the world excepting Europe, which produces about twice as much as this state. In the United States, we are now mining about one half of the world production and most of it is used at home, relatively little being exported. Even the tremendous amounts already mined in this country amount only to one-half per cent of our supply. The significant fact of our tremendous production is not the danger of exhaustion but that we are mining our best grades and those most easily obtained. This will compel future generations to pay much higher prices for inferior coal. The price must steadily rise because as we go deeper for our coal the cost of mining must increase. This rise in price will affect the general price conditions of all manufactured articles and will gradually approach a prohibitive figure.

(Keystone View Company, Inc., N. Y.)

FIG. 37. FUSHUN COLLIERIES, CHINA

Wasteful Methods of Mining. The present system under which our bituminous coal is being mined is far from satisfactory. Herbert Hoover has said that the coal industry is the worst functioning industry in the United States. This industry, which is the basis of all our manufacturing, should be the most highly organized and most sanely managed of all our industries. Yet the opposite is true. This is because the competitive system, under which our mines are operated, leads the individual owners to mine the coal in as large quantities and as cheaply as possible without regard to the future and with no effort at conservation of our supply. The result is wasteful methods of mining whereby much valuable coal is lost to coming generations.

Attempts of the mine owners to organize the industry into a non-competitive one meet with opposition by the government which is suspicious of monopoly conditions. And so the wasteful competitive system goes on, exploiting the mines for the present dollar. Already the effect is beginning to show in abandoned mines which still have much excellent coal in them which can never be mined because of preceding methods which make it impossible to extract the remaining coal. Unscientific methods have stripped many of the mines and have decreased production in certain areas with great losses to our future coal supply. Posterity will have to pay the bill of our present day wasteful, uneconomic methods.

Wasteful Methods of Distribution. Another source of waste is found in our present methods of distribution. One-third of our freight cars are laden with coal, requiring over 50,000,000 tons of coal in carrying other coal to its destination. Much of this carrying could be stopped by intelligent organization of distribution and proper zoning. Oftentime coal is carried from one coal field to cities and localities bordering on another coal field. While it is hard to estimate this waste, it has been estimated that over 160,000,000 car miles were saved during the war by governmental supervision of distribution and zoning.

Waste of Coal in Consumption. There is much waste in coal at its destination. Figures of the Bureau of Mines, United States Geological Survey, tell us that of the average ton of coal 600 pounds are lost in mining, 126 pounds in getting it to the boiler room, 446 pounds go up the chimney in gases and smoke, 650 pounds are lost in converting heat energy into mechanical energy, 102 pounds are lost in heat radiation and ashes, and only 76 pounds are left for useful work. The worst offenders in wasteful use of coal have been the beehive coke ovens where thousands of tons of coal are made into coke for smelting purposes. The method of coke-making takes no account of the gases and chemicals which are wasted to get the coke. More modern plants use the gas in producer gas plants, and reduce the chemicals into valuable ingredients of commerce. In this way all the coal is used up scientifically.

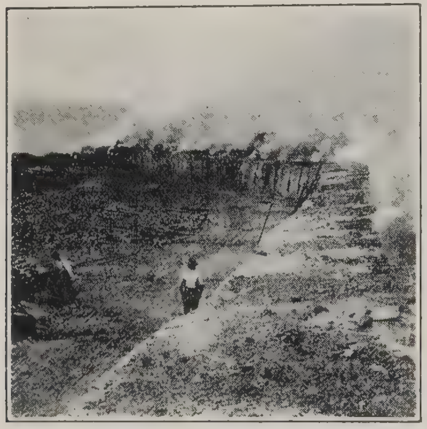

(Keystone View Company, Inc., N. Y.)

FIG. 38. BEEHIVE COKE OVENS

Much coke is wasted in this type of coke ovens.

The usual consumption of coal to make steam provides another great waste. The smoke nuisance of our large cities is an evidence of unconsumed properties in coal. We are anxious to use the coal to get heat only, with no thought of its other properties. While large plants are beginning to use coal more scientifically, the thousands of small plants and householders are needlessly destroying great quantities.

Conservation of Coal. We are now beginning to stop this waste in coal consumption. As has been noted, producer gas plants are spreading, especially in the coke-making areas, which conserve all the coal, using the gas for power, the chemicals as by-products, and the coke for the iron industries. Producer gas plants are becoming more common and their spread into the large cities where the gas can be used profitably for power is probable.

The manufacture of coal briquettes is growing, especially in Europe. In this process the coal dust and some adhesive material are pressed into small balls. The briquettes make good coal and utilize what would otherwise be wasted.

Powdered coal is now being used in some boiler rooms, giving an intense heat which is excellent for steam making.

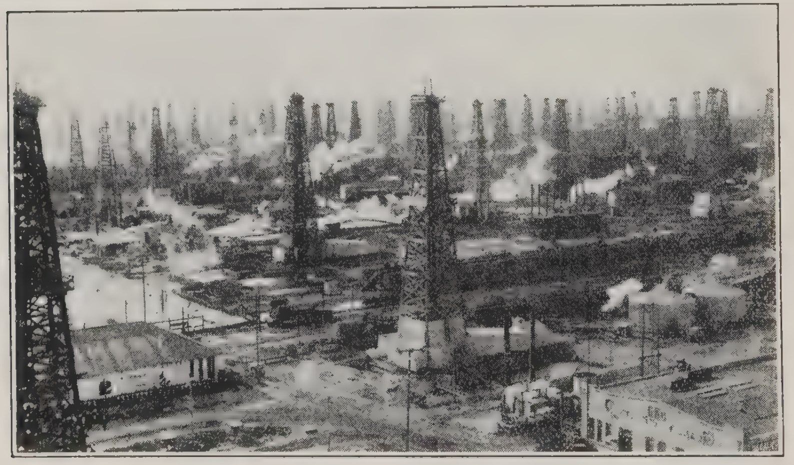
One of the most promising movements to conserve our coal resources originated with the government, which has undertaken a survey of the area between Boston and Washington with the view of finding out the demands for power, heat and light, and the possibilities involved in the location of several super-power stations to generate enough electricity to supply the demands. These super-power stations could be so located as to avail themselves of the cheapest power, either coal or water power. By centralizing the production of power, enormous savings could be made. Much would be saved by the elimination of waste in hauling coal and in its consumption by use of scientific methods whereby all the by-products could be conserved.

TEXT QUESTIONS

1. Trace the rise of the use of power by man from earliest times.
2. Discuss the importance of mechanical power to society today.
3. Why did England early take to the use of coal power for steam?
4. Why was America so slow in using coal?
5. Explain the proportion of coal and water power now used in United States.
6. What is the extent of the world's coal deposits?
7. Explain why coal must rise in price even though we still have much left.
8. Show how this will affect the price of all manufactured articles.
9. Why are our mining methods so wasteful? Explain.
10. Show how we waste much coal in its distribution.
11. How do we waste coal in its consumption? Explain.
12. How may we stop this waste in consumption? Explain.
13. Show how super-power stations could save much coal.
14. How may much coal be saved in the coke industry?

SECTION 2—PETROLEUM

Growth of the Use of Petroleum. Although the existence of petroleum was known several hundred years before Christ, mankind used it but little and it did not enter into commerce until the discovery, in the latter part of the last century, that kerosene could be used as an illuminant. The refining of kerosene from petroleum and its use for lighting purposes revolutionized the lighting methods of mankind. The sinking of new wells spread rapidly, pipe lines were constructed to conduct it to the refineries, and the whole industry was built up around the extraction of kerosene from petroleum.



(Keystone View Company, Inc., N. Y.)

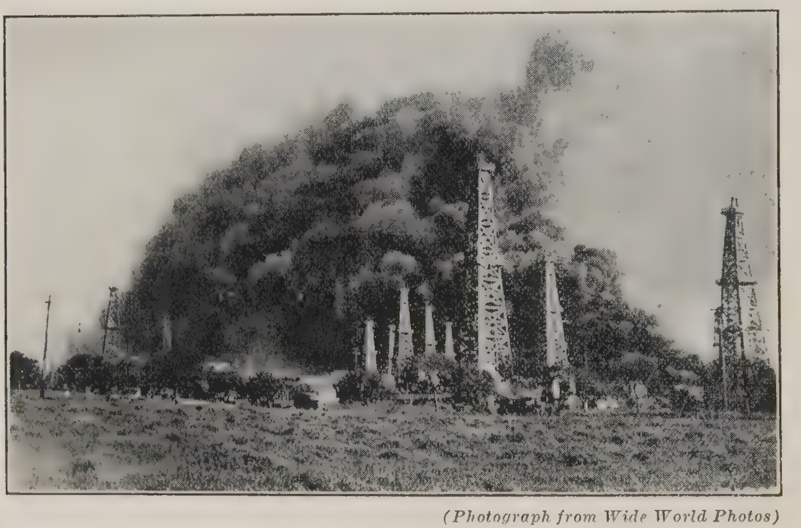
FIG. 39. PRODUCTION OF PETROLEUM IN CALIFORNIA

About 1900 the automobile began to demand more and more gasoline, which up to this time had been a by-product of the refining process. The emphasis gradually changed from the extraction of kerosene to the extraction of gasoline, the output of which grew to large proportions made possible by the discovery of new oil fields. Our per capita output was increased from .13 barrels during the decade 1860-1870 to 4.27 barrels during the decade 1910-1920. In January, 1929, experts estimated that we had produced about 100 barrels per person in the United States up to that time. Our annual production now is well over seven barrels per person, two-thirds of the world's production, and is increasing each year.

It can be easily seen that our oil reserve will soon be exhausted at the present rate of production unless our rate of consumption is lessened or new fields discovered. There are many shale formations well scattered over the United States which will yield petroleum, but its extraction from this shale will greatly increase the cost of production. Thus we find that a cheap supply of petroleum must soon give way to exhaustion and while our available supply of petroleum may last for many years the price must inevitably rise. As in the case of coal, this price rise will seriously influence all our commercial life. Because petroleum has been the most easily produced and handled source of power, it has been exploited more than any other power resource and has already reached a point where its future supply and conservation are of the greatest importance to industry.

The Uses of Petroleum. Although the use of petroleum is comparatively recent in the world's history, already it has found a place in our commercial and industrial life which makes it a necessity of the first importance. It provides gasoline for our internal combustion engines which run our many automobiles, motor boats, and industrial engines. It supplies kerosene which is the most important illuminant in the absence of electricity and gas. The high speed machinery of the present day depends almost wholly upon the various lubricants derived from petroleum. As a source of fuel it is fast becoming popular and in some cases, a real necessity to industrial life. Many of the important by-products of petroleum enter largely into industry.

The Use of Gasoline. The invention of the internal combustion engine found in gasoline an ideal source of power because of its power, cheapness, and availability. Without the presence of bountiful and cheap gasoline, the automobile would have had a slow growth, if any. Today the automobile industry with its millions of dollars investment looks to this supply for its support and continued growth. Up to this time, no adequate substitute power has been discovered although several possibilities have appeared. Probably denatured alcohol presents the most attractive possibility as a substitute power for gasoline but it still remains a problem for the chemists and producers to find a way to produce this in quantities at a low price.



(Photograph from Wide World Photos)

FIG. 40. WASTEFUL OIL FIRE NEAR LOS ANGELES

Unfortunately, the internal combustion engine as now used on automobiles is very wasteful of gasoline power. It is estimated that less than 5% of the energy of a gallon of gasoline is used in the operation of our present type automobile engine, while about 95% of the energy is wasted entirely. Improvements will eventually reduce this waste some, possibly to 90%. If a proper use of the energy in a gallon of gasoline could be made, our cars would run over 300 miles per gallon instead of at the low mileage we now get. Thus it seems that the very machines which depend most upon the use and supply of cheap gasoline are the worst offenders in its conservation. It should be noted here that the use of the gasoline engine is a considerable source of mechanical power beyond its use in transportation in automobiles and motor-driven boats. It is estimated that over 1,000,000 horse power are developed in this country by small gasoline engines in industrial plants and on farms, with the same percentage of waste in gasoline.

The Use of Kerosene. Although the emphasis in the refining of petroleum has shifted from kerosene to gasoline, the extraction and distribution of kerosene occupy an important place. Relatively little kerosene is used to produce power, the great bulk of the supply being used as an illuminant. People in the large centers of population, where electricity and gas provide the light, find it difficult to realize the magnitude of the kerosene trade in the areas where it constitutes the only form of lighting available. This trade assumes large proportions in our petroleum exports.

Our American kerosene, together with candles made from paraffine, goes all over the world, and is found in many regions almost unknown to the ordinary course of trade. This trade is highly organized, especially by the Standard Oil Company which has distributing agencies in all the countries which depend upon this form of lighting. The use of kerosene as a fuel in oil stoves forms no little factor in the consumption of petroleum, especially in regions where kerosene is indispensable because of lack of other fuels.

The Use of Petroleum Lubricants. Modern invention has produced machines of high speed which depend wholly upon petroleum-extracted oils for their lubrication. Certain oil fields produce petroleum which is better adapted to the making of these oils, while other oil fields produce petroleum better fitted for fuel purposes. Crude oils rich in paraffine are refined to make the various grades of motor and machine oils and greases. The demand of the automobile industry for these specialized oils and greases runs into staggering quantities. The wheels of industry must be properly lubricated or loss will follow.

Probably one of the greatest sources of loss in the operating of automobiles is the use of poor oil, or the use of oil after it has been diluted with gasoline and made dirty and filled with tiny bits of steel by the wear and tear of operation. The life of any car can be prolonged by the use of the right type of oil and by having it frequently changed. There is much waste in the present day method of throwing away used oil when it could be again refined and made useful. There are some vegetable and animal oils which can be used somewhat under certain conditions in place of the petroleum oils, but as yet no substitutes have been discovered for the petroleum oils which can fill the demands made upon them. Proper conservation of our petroleum resources is absolutely imperative to keep the supply of proper lubricants up to the increasing demands of industry and transportation.

The Use of Petroleum as a Fuel. The use of petroleum as a fuel is fast becoming more and more popular, especially in regions where the coal supply is either lacking or difficult to obtain. Thus we find the locomotives of our Southwest burning oil to generate steam, and the industries of California depend upon petroleum for their fuel supply. The use of fuel oil on our ships is fast spreading, which find it a convenient fuel, easy to load, easy to handle, and taking up less space than coal. It is particularly well adapted for fuel on our warships because of the facilities for loading under all kinds of weather and in war conditions.

The By-Products of Petroleum. The process of refining petroleum yields many by-products, some of which are important articles in industry and commerce, such as rubber solvents, cleaning fluids, road oils; paraffine products like wax, chewing gum and candles; and various drugs, electric carbons, and vaseline products. These articles are by-products of the general processes of extracting the more desired gasoline, kerosene, and oils, and in a way are a conservation of our petroleum resources. This by-product industry has a great future and already chemists are busy utilizing every part of the crude petroleum as it passes through the refineries.

Location of Petroleum Fields. The following petroleum fields are the principal regions of production in the United States which produces over twice as much at present as all the rest of the world put together. The oldest field is the Appalachian Field which includes New York, Pennsylvania, eastern Ohio, West Virginia, Tennessee, and Kentucky. The Lima-Indiana Field includes the northern areas of Ohio and Indiana near their border. The Illinois and southwest Indiana Field includes an area along their border line. The Mid-Continent Field is located in Kansas, Oklahoma, and northern Texas. The Gulf Coast Field takes in Louisiana and southern Texas. The Rocky Mountain Field is located principally in Wyoming. The most western field is located wholly within California and is a valuable source of power there where coal is lacking.

Mexico ranks next to our country in petroleum production. Then comes Russia, Persia, the Dutch East Indies, and Venezuela. Petroleum is found in Africa, Australia, South America, Japan, and China, although the industry has not yet been developed to any great degree in any of these areas.

Conservation of Our Petroleum Resources. Much of the present waste of our petroleum resources can be eliminated, and our limited supply can thus be conserved. The present system of production, which is discussed more in detail in another chapter, can be vastly improved. By a proper control of the sinking of wells, many superfluous ones can be done away with. The eager rush of oil prospectors results in badly organized and highly competitive extraction. To gain the most profits, the owners hasten to sink more wells than are necessary, and in their desire to secure as much of the oil as possible while it is present, they overproduce and flood the market.

Poor workmanship often results in the flooding of the subterranean reservoirs with sub-surface water, thereby not only ruining the well that is being sunk but also others which are tapping the same source. Scientific methods of drilling can stop this. Much natural gas is allowed to escape while wells are being drilled, especially when it is a hindrance. This gas could be conserved and used as a source of power. Many times, thousands of barrels are wasted in bringing a gusher because of lack of suitable appliances to control its output. One such gusher in Mexico caught fire and burned up over $3,000,000 worth of oil before it was conquered. Excessive evaporation can be stopped after the petroleum reaches the surface, by more scientific reservoirs and the using of covered tanks. There is much seepage in the pipe lines which convey the oil to the refineries. More scientific means of using these pipes in the industry will result in enormous savings. More attention will be paid to petroleum conservation as the price increases.

TEXT QUESTIONS

1. What discovery led to the greater use of petroleum for light?
2. Show how the invention of the automobile increased petroleum production. Prove your answer.
3. What are the probabilities of high price gasoline in a few years? Explain.
4. Outline briefly the chief uses of petroleum for power.
5. Discuss the use of petroleum gasoline by automobiles. By gasoline engines in general. What are the possibilities of a substitute for gasoline along these lines?
6. Discuss the use of kerosene as an illuminant in the United States. In the world in general.
7. Show the importance of petroleum for lubricants. Explain.
8. Where is petroleum especially popular as a fuel? Why?
9. Make a list of the principal by-products of petroleum in use to-day.
10. Indicate on a map the location of the principal oil fields today in the United States. In the world.
11. Explain how oil is wasted under present conditions of production and distribution.

SECTION 3—WATER POWER

Extent of Water Power Resources. Because of the various technical factors that enter into the computation, an exact estimate of our potential water power resources is impossible. The actual development of our water power resources, however, can be ascertained with a fair degree of accuracy. Using the figures of the United States Geological Surveys, we find that Africa leads the continents in the amount of potential water power and also in the lack of water power development.

Although the United States uses 40% of the developed water power of the world, she utilizes only one-fifth of her estimated water power resources. The Pacific States have the largest amount of undeveloped water power in this country, but the manufacturing states of the East and South have developed the greatest percentage of their available water power. New England leads in the use of her water power, availing herself of 86% of her possible supply. Europe ranks next to North America in the use of her water power resources, both in amount and in percentage utilized. Sweden and Switzerland are well favored in this resource and use. Fortunately, the states in the United States which are lacking in coal are best equipped in water power resources.

Reasons for Lack of Utilization of Water Power. In this country we have developed our water power resources only up to a point where they contribute less than one-fifth of our power supply in general. We may reasonably inquire why this condition obtains and why these valuable power resources lie idle. Many people have been led to believe that this source of power is being held in reserve for future generations, to be used only when our other power resources fail. There has been a tendency on the part of the government to restrict its free use without adequate returns to the public, but we shall also find that there are economic grounds for its non-development.

Recent Advance in the Use of Water Power. Many of our water power resources have been made available for power purposes only comparatively recently by the improvements made in transmitting electricity over long distances. Previously water power could be used only at its source, thus restricting the location of factories, mills, and other users to places which in many cases were ill adapted to manufacturing because of the difficulty of transporting raw materials to the site and manufactured articles to the markets. The direct use of water power was uncertain because of the fluctuation in the water supply, the mills having to shut down frequently in dry seasons. Naturally, under these conditions, cheap coal power was superior as it permitted better locations for factories and supplied a regular and steady supply of power at all times.

(*Keystone View Company, Inc., N. Y.*)

FIG. 41. THE VICTORIA FALLS, AFRICA
Africa leads in available water power.

The making of hydro-electric power and its transmission from water power sites to distant manufacturing centers changed this situation entirely and freed water power from its previous handicaps, the water supply being made more regular by dams which impounded water to sustain a regular flow at all times. Since the utilization of water power in making electricity and transmitting it over long distances, sometimes as far as 400 miles, water power has increased in amount and in percentage to our general power supply.

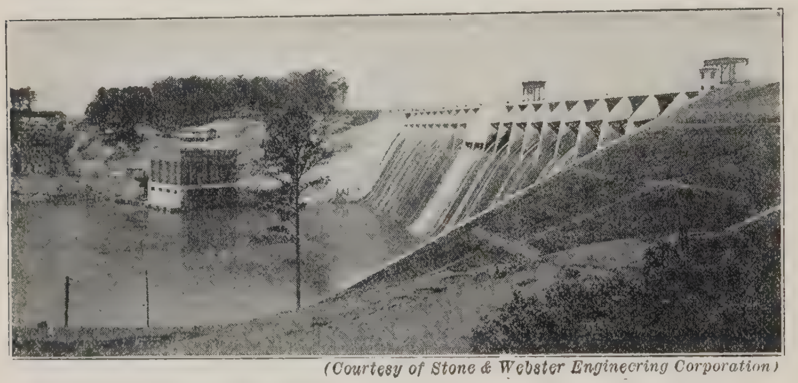
Large Investment of Capital Necessary. The annual maintenance of these large hydro-electric plants may be more economical than that of those using steam power, but the large amount of capital necessary to secure the site, to erect dams to impound the water, to purchase the land to form the reservoirs, to install the machinery and transmission lines, has discouraged men from extensive investments where, although the power supply was cheap, the interest charges were very high. Men preferred the cheaper initial investment, even with the larger annual maintenance charge for power to be found in coal-powered plants. Thus only particularly well favored sites have been developed for hydro-electric plants.

The future use of many of our less desirable water power sites will be delayed until the cost of coal has reached a point where it exceeds to a marked degree the interest charges of the large initial investments necessary to develop the water power sites. Then, too, water power has to compete with old established power plants run by coal, whose investment has already been made. It would be foolish to scrap these plants, especially as the coal used forms a comparatively small percentage in the annual expense of operating.

Governmental Restrictions. In its zeal to protect the interests of the public from exploitation by the big power companies in the matter of the utilization of water resources, the government, by restrictive legislation, has made it difficult, and in some cases impossible, for capital to secure some of the most desirable sites. While this attitude on the part of the government may be justifiable in some cases, some method should be devised of retaining a measure of control over private companies acquiring these sites, which would be just both to the public and to the companies. Leases could be drawn which would retain the equitable interests of the people but still encourage capital to develop these water power resources. Regulation rather than restriction would invite capital, and a larger program of water power development would result with mutual benefit.

Location of Water Power Sites. One reason why only one-fifth of our available water power is being used is its location in the far western areas and in the Rocky Mountains. Power generated there must be transmitted long distances for use, requiring costly construction and installation, because much of the country where the power is located is wholly unfit for the building of industrial centers.

California, Washington, and Oregon have developed some of their water power for manufacturing, but much of the undeveloped water power remains unavailable because of its location. It is true that much of the well situated water power, near to the manufacturing centers of the East, and South, has been developed, but this amount of developed water power is small compared to the great potential water power of the Pacific and Rocky Mountain regions which must lie idle for many years until its development is justifiable from an economic standpoint and the demand for power rises to a place where its operation becomes profitable.



(Courtesy of Stone & Webster Engineering Corporation)

FIG. 42. HYDRO-ELECTRIC DEVELOPMENT, CHATTAHOOCHEE RIVER

Competition with Coal Power. As long as competition governs the business world, the power which is the cheapest and best for the money at the time will prevail. How coal displaced the early direct use of water power has already been noted. Having secured the lead, coal still maintains it as a power supply even in competition with the more modern use of water power in hydro-electricity production. With the increased use of electricity in industry, comes a direct competition between carbo-electricity and hydro-electricity, with the former leading at present. It is true we are using up our best grades of coal and those most easily obtained. It is also true that in the competition of the power resource the best and most easily operated water power sites have been developed. As coal becomes more costly, so too will the installation and utilization of our undeveloped water power. Probably at some time in the future, water power and its use, through hydro-electricity, will win out, but the time will be postponed until our coal deposits are exhausted to the degree that the price of coal will be prohibitive. The use of fuel oil will affect this situation but the reserve of this resource does not compare with either of the two chief supplies of power, and so is but a temporary factor.

Irrigation Projects. In connection with the use of water power, there is also another factor, that of irrigation. In some of the water power sites the water can be used not only for power to generate electricity but also, later, for irrigating what would be otherwise barren land. This combination of power and irrigation purposes diminishes the relative cost of either and makes practical what would otherwise be doubtful ventures. Many of our western lands are being reclaimed in this manner and made to produce heavily. Where power sites and dry areas are found together, the combination works well for both.

Water Supply for Large Cities. One of the great problems confronting every large city is that of an adequate, good water supply. Many times, this necessitates the taking of hundreds of acres of land for reservoirs to hold the dammed-up waters. Great care must be used to protect these reservoirs from pollution. Sometimes at great cost the water is brought many miles through aqueducts and then pumped to the thousands of homes through small pipes. The amount of water consumed is enormous and is not an unimportant factor in its effect on the location of water power developments. As our cities grow, so also does the problem of the water supply and plans must be laid far in advance of expected demands to supply the needs of an ever increasing city population.

TEXT QUESTIONS

1. Why is it so difficult to estimate our available water power?
2. Where is the most unused water power in the world today? Why is it not used more there?
3. Why do we not use more of our water power resources? Explain.
4. What section of the United States uses the greatest per cent of its available water power? What section uses the lowest per cent? Why?
5. What has led to increased use of water power in the United States?
6. Why is large investment of capital necessary in water power?
7. How does the government interfere with the use of water power?
8. Explain how the water power resources of our western areas are unavailable for industrial purposes at present.
9. Discuss the competition between coal and water power.
10. Explain when water power will rank even or higher in use than coal power, giving reasons for your answer.

PROBLEMS AND PROJECTS

1. Make a list of all kinds of power used by man.
2. Outline the results if our power supply should stop.
3. What kinds of power are used in your community?
4. Show how water power influenced early New England.
5. How can some of our wasteful mining be stopped?
6. On an outline map show the coal power resources of the world.
7. On an outline map indicate the petroleum fields of the world.
8. Give the advantages and disadvantages of super-power plants.
9. Describe the action of a gasoline engine.
10. Forecast the future supply of gasoline. Give reasons.
11. Forecast the coal supply of the future. Give reasons.

12. Forecast the oil supply of the future. Give reasons.
13. Give advantages and disadvantages of each power supply.
14. Gather pictures of power plants.
15. Have you electricity available in your community? Where does it come from? What power furnishes it?
16. Where does your drinking water supply come from? How is it distributed from its source to your house? Trace its journey.
17. What railroads use electricity? Why?

TOPICS

1. The Standard Oil Company.
2. The history of oil production in the United States.
3. Coal strikes and their effects.
4. Diesel engines.
5. The history of electricity.
6. Irrigation projects in the United States.
7. The water supply of large cities.
8. The power of the future.
9. Some large water power plant.
10. Some large steam plant.
11. Petroleum as a power resource.
12. Oil heating.
13. Ways in which to save coal in heating homes.
14. Super-power plants.
15. The conservation of power resources.

FOR CLASS DISCUSSION

1. Government interference with power resources is not justifiable.
2. Water power is more economical than steam power.
3. Exportation of petroleum products should be stopped.
4. Petroleum is a source of international danger.
5. Coal strikes have done more harm than good.
6. The government should own and control the coal mines.
7. Petroleum will displace coal as a house heating agency.
8. The present owes no duty of conservation to the future.

CHAPTER IX

GOVERNMENT AND COMMERCE

Influence of Government on Commerce and Industry. One of the most potent factors in the commerce and industry of any nation is the character of its government. From earliest history, the rise and fall of trade may be traced directly and indirectly to the character of the government under which it existed. Under weak and inefficient governments commerce and industry are held back, while under strong efficient governments they grow and expand. The general character of the government of a region often counteracts many favorable or unfavorable physical factors.

Russia, with her wonderful natural resources, has lagged far behind her possibilities principally because of a poor and badly organized government. England, with comparatively few natural resources, has forged ahead industrially and commercially, because a well organized government encourages and helps in every way possible.

A brief examination into the work of our own government in the United States will disclose that our rapid and powerful growth in industry and commerce is due not only to our endowment in natural resources, but also to the aid afforded by one of the most highly organized systems of governmental aid that has ever existed. Because this governmental aid is so highly organized, so great in extent, we shall be able to touch only upon the most apparent phases, leaving the examination of detail to the texts in civics.

The Department of State. The aid of this department is felt especially in our foreign trade. Under the supervision of this department are the diplomatic service and the consular service. The diplomatic corps represents our government in foreign lands. Some of its duties are to transmit official correspondence between our government and other governments, to keep our government informed upon the happenings in the country to which they are assigned, to help make treaties with foreign countries, to help spread information about the United States, and to protect American interests in general and American citizens in particular.

The consular service is composed of hundreds of consuls stationed all over the world and found in every commercial center. They are the commercial agents of American interests. Some of their duties are to advance American commerce in foreign lands pointing out commercial opportunities for our business men, to furnish reports about the needs and business methods of the regions where they are, to answer all inquiries concerning trade conditions, to help enforce our custom laws by detecting frauds and attempts to smuggle, to help regulate immigration to this country by inspecting passenger lists and vessels bound for America, to furnish aid to shipwrecked crews of American ships, to settle disputes aboard American vessels, to act legally for Americans abroad, to vise passports, to settle estates for Americans dying abroad, and to protect our interests.

(Photograph from Wide World Photos)
FIG. 43. THE NATIONAL CAPITOL

The value of the consular service to our business men is incalculable and our foreign trade would be impossible without its organized help.

The Treasury Department. This department renders a very vital aid to commerce and industry because under its care are placed the finances of our country. In addition to collecting, storing, and disbursing our public moneys, it also regulates and maintains our excellent monetary system, without which big business would be impossible. A poor system of money would ruin our best endeavors to build and maintain a prosperous and stable commercial and industrial life. All our coins are made and stamped at the United States Mint under the control of this department.

(Photograph from Wide World Photos)

FIG. 44. TREASURY DEPARTMENT, WASHINGTON, D. C.

All our paper money of various kinds is printed by the Bureau of Engraving and Printing, which also prints our government bonds, postage stamps, and all other engraved papers necessary to carry on our government. Our national banking system is controlled and regulated by this department. The taxes on articles made in this country which are subject to the internal revenue tax, such as tobacco goods and playing cards, are collected by the Internal Revenue Service which also enforces the national narcotic and prohibition laws. Taxes on articles coming into this country are collected by the Customs Service.

One of the ways in which this department aids commerce is the maintenance of the Coast Guard Service, of which the Life Saving Service is now a part. This service maintains revenue cutters which patrol the seas. Some of their duties are to destroy floating dangers to navigation, to carry aid to vessels in distress, to prevent smuggling and rum running, and to enforce the laws governing quarantine, neutrality, fisheries, seals, and navigation. Another branch of this department of great importance is the Bureau of Public Health.

The Department of Agriculture. The function of this department is to aid agriculture which is one of the basic industries of our country. So vast are the duties of this department that we shall only mention the more important bureaus. The Weather Bureau receives reports of weather conditions from all over the country and from this information forecasts the weather. This service is invaluable, not only to industries of an agricultural nature, but to all kinds. Storm and frost warnings save millions of dollars yearly. The Bureau of Plant Industry scours the world for new plants which will be of commercial value to us. In the last twenty-five years over 50,000 new plants or seeds have been introduced, some of which, like the navel orange introduced in 1870, have been of immense value to us.

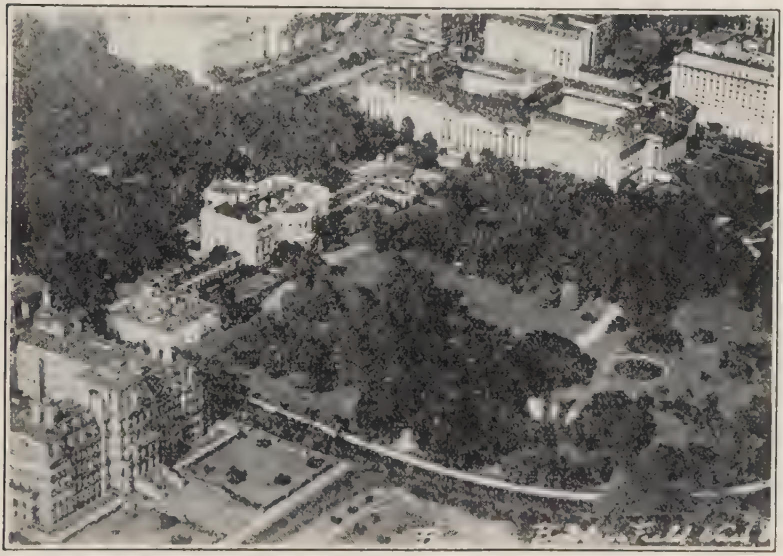
The Bureau of Animal Industry has charge of the livestock industry and is at work eradicating diseases, supervising the quarantining of diseased animals, inspecting meat and meat products, and promoting animal husbandry in general. The Bureau of Entomology is studying plant pests and animal pests, with the view of finding the best ways to destroy them. The Bureau of Soils studies the various soils and advises crops for them. The Bureau of Chemistry analyzes foods and drugs for impurities and adulterants. The Forest Service administers the national forests and studies how best to grow and utilize our dwindling wood supply. The Bureau of Public Roads supervises the construction and maintenance of Federal aided roads. There are several other bureaus, all of which are organized to help in the improvement of agriculture. The Bureau of Information disseminates information gained by this department.

The Department of Commerce. This department is charged with the work of promoting the commerce of the

United States, and its mining, manufacturing, shipping, fishery, and transportation interests. Its various bureaus cover a tremendous field of activity, all directed to helping commerce and industry. The Bureau of the Census takes a census every ten years and compiles statistics covering a wide range of subjects. All the time it is busy gathering all sorts of statistical information of great value to business.

The Bureau of Foreign and Domestic Commerce helps our foreign and domestic commerce by investigating business conditions at home and abroad and compiling informative reports on manufactures, transportation, communication, and trade in general. The Bureau of Standards not only has charge of our weights and measures, but also is busy establishing all kinds of standards throughout industry and commerce. In this way we are making great strides in effecting a general standardization in industry and commercial products. The Bureau of Fisheries is helping in the propagation of food fishes and their conservation. It enforces the laws regarding fur-seal, salmon, and sponge fishing. The Bureau of Lighthouses maintains these aids to navigation and in addition establishes and maintains buoys and channel markers. The Coast and Geodetic Survey surveys and maps our coasts and large rivers for navigators. The Bureau of Navigation has jurisdiction over our merchant marine and its sailors. The Patent Office registers all patents and copyrights. The Bureau of Mines makes scientific and economic investigations in our mining industries.

The Department of the Interior. This department has charge of several activities, all of which have an important bearing on our industrial and commercial life. The General Land Office has charge of all public lands. The Federal irrigation projects all come under the Bureau of Reclamation. These projects have had an important effect on our western growth, changing worthless land into productive areas. The Geological Survey is engaged in surveying and mapping our country. It has already covered much of the country, especially in the East. The maps of this service cover not only the topographic features of the country but also the geological features. They are very valuable helps to engineers engaged in railroad construction, in mining, and in the petroleum regions. Other bureaus of this department that have an indirect effect on our commerce and industry are the Office of Indian Affairs, the National Park Service, the Bureau of Education, and the Bureau of Pensions.



(Keystone View Company, Inc., N. Y.)

FIG. 45. LEFT TO RIGHT—NAVY BUILDING, WHITE HOUSE, TREASURY DEPARTMENT

The Department of Labor. This department is charged with the promotion of the welfare of the wage earners in our country. Through the Bureau of Labor Statistics it gathers and diffuses all kinds of information on subjects connected with labor and labor disputes. The Bureau of Immigration has charge of the enforcement of laws regarding immigration into this country. The Bureau of Naturalization attends to the naturalization of aliens. The Children's Bureau is busy gathering data relative to the welfare of children of all classes and publishing the more important studies. The Women's Bureau looks after the welfare of women wage-earners.

The War Department. In addition to its important function of being in charge of our national defense plans, including the army and coast defenses, this department also has charge of the national inland waterway transportation on rivers and canals, of the Panama Canal, of the administration of Porto Rico and the Philippine Islands, of the river and the harbor improvements, and of bridges over navigable rivers. Military phases of this department have an indirect effect on commerce; civil duties affect commerce directly.

The Navy Department. This department is charged with the upkeep and organization of our navy. Through its Naval Observatory, carefully secured information is secured and passed on to navigators. Our time is set to the time given out by this observatory daily. The Hydrographic Office collects valuable information for the mariners by its studies in foreign waters along hydrographic lines. Its information is compiled and printed and sold at cost to navigators. This office is highly valuable to commerce in that it prevents many marine disasters. It also maintains a radio compass service by which mariners can easily locate their positions on the high seas.

The Department of Justice. This department affects commerce and industry indirectly by the enforcement of national laws and the direction of the Federal Court system. Under this department, functions the secret service which prevents much fraud in business and smuggling. No business would be safe without adequate law enforcement and in this department we find this to be the principal duty.

The Post-Office Department. No other department of the government comes into so frequent and direct touch with our national business as does this department. All over the country are spread hundreds of post offices with thousands of mail carriers and clerks. In every activity of this department we find a help to commerce and industry. Among its many duties we find each one a real necessity to the successful carrying on of business.

Two-cent postage, parcel post, rural free delivery, railway mail, money orders, postal savings accounts, coast to coast air mail, international deliveries, registration of letters, special delivery letters, and many other aids, all tend to increase our business prosperity. A moment's consideration of what loss would result upon the cessation of these services brings home to us how vital this department of the government's aid is. At present this department operates at a financial loss because of two reasons, first, because in its desire to foster more correspondence and so more business, it maintains a very low rate for the service rendered, and second because it carries free an immense amount of mail for members of Congress and other departments.

Independent Boards and Commissions. At Washington there are several boards and commissions created by Congress which function independently of the regular departments. The Interstate Commerce Commission has charge of all interstate commerce, its greatest influence being felt on the transportation systems which are regulated by it. The United States Labor Board is charged with adjusting differences between the railroads and their employees. The Civil Service Commission controls the testing and appointing of minor governmental employees. The Federal Reserve Board has charge of the Federal Reserve Bank system.

The United States Shipping Board encourages a national merchant marine and operates many of our war time ships, both passenger and freight. The United States Tariff Commission studies the problems connected with our tariff and gathers information for use on that subject. The Federal Trade Commission was formed to prevent unfair methods and competition in trade. The Pan-American Bureau encourages more friendly relations between all the countries in North and South America.

Tariff and Taxes. One of the functions of governments is to tax. Some governments use this privilege to tax those articles from other countries which compete with production within its own borders. A tax placed on imports is called a tariff. Some men believe that a tariff should be placed on imports for revenue only, while others believe that a tariff should be raised to a figure which will prevent foreign competition with domestic production. The first are called free traders and the second are called protectionists.

Tariffs are man-made rules which may help or hinder commerce and the industry depending upon commerce.

Taxes in this country are levied by city, state, and nation. Our principal ones are on real estate, incomes, personal property, inheritances, and domestic products such as tobacco. Taxes lower profits directly but increase them indirectly through the aids received from the government.

TEXT QUESTIONS

1. Illustrate how a good government helps commerce overcome physical drawbacks. Illustrate how a poor government can retard commerce even where there are wonderful physical resources.
2. How do diplomatic agents aid our commerce? Consular agents?
3. Show how the Treasury Department plays an important part in our commerce and industry.
4. Enumerate the ways in which the Department of Agriculture helps our commerce and industry.
5. Outline the ways in which the Department of Commerce aids our commerce and industry.
6. How does the Department of the Interior help?
7. Describe the ways in which the Department of Labor aids.
8. Besides protection, in what ways does the War Department help commerce?
9. The Navy Department?
10. Show how enforcement of the law by the Department of Justice has a direct bearing on commerce.
11. Why does the Post-Office Department operate at a loss?
12. Name some of the ways in which it helps commerce and industry.

13. Name and tell how some of the various boards and commissions at Washington help our commerce.
14. Show how the government in general helps commerce.
15. Explain how we get back our taxes in improved service and governmental aid.

PROBLEMS AND PROJECTS

1. Make a diagram showing the ways in which the departments at Washington aid commerce. Do the same for your local home government. For your state government.
2. Find out the name of the present secretaries of the various departments at Washington. How are they chosen? What do they do? How do they help the President?
3. Name some of the important treaties that have influenced our commerce.
4. Secure some consular reports. Make a digest of them. Show how they help our business men.
5. Describe how to obtain information about commerce and industry from the departments at Washington.
6. Select some topic and secure information about it from Washington.
7. What type of articles are taxed by the government in the country? Coming into the country? How are these taxes collected?
8. Why are the revenue cutters under the Treasury Department rather than under the Navy Department?
9. Show how the Department of Agriculture has helped in some definite way to improve the agriculture of our country. Give illustration.
10. How are the weather reports made up? Explain. Illustrate their use.
11. Why is standardization of weights and measures desirable? In what other ways does standardization in commerce help?
12. Give a definite illustration of how the Department of Commerce has helped.

13. Get a topographical map of your section and show how it can be used.
14. What are the present immigration laws? The present naturalization laws?
15. Which department built the Panama Canal? Why?
16 What is the present situation politically in the Philippine Islands?
17. What does hydrographic mean?
18. Outline what would be the effect of the stoppage of our post-office system.
19. Select one independent board or commission and give a definite illustration of its work.
20. Make a list of parallel functions carried on by the state.

TOPICS

1. Discuss one department of our government as to history, functions, and effects.
2. Child labor in the United States.
3. The functions of the Supreme Court of the United States.
4. The Interstate Commerce Commission.
5. Immigration.
6. National prohibition.
7. The Philippine question.
8. The Cabinet.
9. The federalization of governmental functions.

FOR CLASS DISCUSSION

1. The present restrictions on immigration are justified.
2. The child labor amendment should be passed.
3. A Department of Education should be established.
4. The government should own and control everything.
5. Our governmental aids are too highly centralized.
6. More power should be given to the national departments.
7. Our policy in the Philippines is not just.

CHAPTER X

BUSINESS ORGANIZATIONS

Financial Organization. As man becomes more civilized and the importance of commerce and industry increases, it becomes necessary to organize and regulate the means of exchange. Throughout the centuries, man has gradually built up and improved certain means and methods of dealing with his fellow man until now they have attained a high degree of efficiency. The big business of today is possible because of the organization and coöperative methods of man in commerce. Without them the tremendous volume of business now carried on would be impossible. These means of doing business are a result of commerce and also a cause of commerce in that they make it possible. In a discussion of the factors that enter into commerce and industry, it is fitting that we should study briefly some of the more important ways in which man, by organization and custom, has rendered large transactions ordinary.

Money. So accustomed are we to the use of money that it is hard for us to realize that there was a time when it did not exist. The early merchants were limited to barter, exchanging product for product. The limitations of this method of doing business are obvious. Eventually as the demand for trade increased, articles which were of common use and had a fairly constant exchange value became the medium of exchange and standard of value.

At times such things as cattle, furs, cubes of salt, beads, wampum, tea, tobacco, and cotton cloth have served as mediums of exchange and a form of money. Gold and silver early became popular and eventually became the basis of what we know as money. At first lumps of silver and gold of definite weights and fineness became the media of exchange. To insure the correctness of their weight and fineness the ruler stamped them with some kind of a seal. This led to the shaving of the bottom side and so lessening the weight. To prevent this the lumps were then stamped top and bottom with a seal. Ancient coins were thus stamped leaving a very irregular edge which could be trimmed gradually. Centuries later the invention of milling the edges to prevent fraud stopped this coin shaving and the coin of today is difficult to cheapen. At the present time coinage is left to the government wholly, and great care is used to prevent counterfeiting and to preserve the standard value.

(Keystone View Company, Inc., N. Y.)

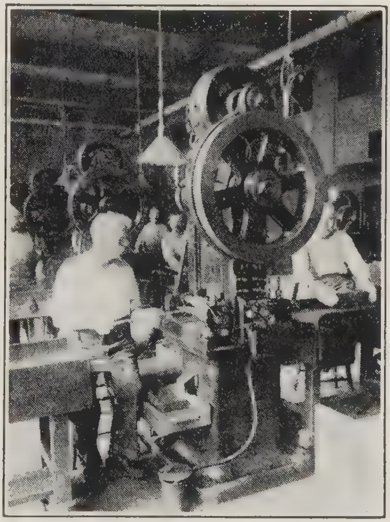
FIG. 46. A SALONICAN MONEY CHANGER

Gold and silver are preferred for coins because of their value, durability, portability, divisibility, cognizability, and general stability of value. Because of their value they make conveniently sized coins, wear well, are easily carried about, can be easily made into larger or smaller coins, are easily recognized and hard to imitate and, because of the vast amount now in circulation in the world, they fluctuate little in value from year to year. The smaller coins, called token money, comprising our pennies, nickels, dimes, and quarters, are either made of cheaper metals or of alloys. If made of gold they would be too small for convenience. It is interesting to note here that during the Middle Ages a petition for the issuance of smaller value coins for the poorer classes was based upon the desire "to buy our beer and to extend our works of charity."

Paper money is sometimes called credit money because it expresses credit on its face. This class of money is now used extensively. It is a representation of coin money and when of value always has a reserve of silver or gold money for which it may be exchanged at any time. In large transactions paper money is much more convenient as large value can be represented on a small piece of paper.

The government has the power to state which kinds of money must be accepted for debts and taxes. This kind of money is called legal tender.

When the purchasing power of money goes down, it is usually the result of inflation, the increase in quantity. When it goes up, it is the result of deflation, the decrease in quantity. When money is inflated the creditors suffer, when deflated the debtors suffer. The rates of exchange between countries having different systems of money is caused by inflation and deflation of the money values.



(Keystone View Company, Inc., N. Y.)

FIG. 47. COIN MAKING MACHINES, PHILADELPHIA MINT

Standards of Weights and Measures. In a former chapter we told how systems of weights and measures were established at the medieval fairs for the convenience of the merchants. Some of these systems have come down to us and are used in business today. Unfortunately for international trade, there are several systems wholly different from each other. Throughout the English speaking world we find a similarity because of the customs inherited from the mother country of England. These systems are in use in the United States and notwithstanding the fact that they are unscientific will probably be retained for a long time. The cost of changing all our scales and measures to some other system, even if superior, would be exorbitant.

The French have a system called the metric system, which is founded upon a decimal part of the world's circumference. All their weights and measures are based upon this one unit and graduations in the scales are made in decimal procedure. This makes it much easier to calculate than in our non-decimal systems. In our country, the metric system is permitted but not compulsory. Engineers, chemists, and other scientific men are using it more and more. Standards of this and our own system are maintained at Washington for testing. A universal system of weights and measures appears to be remote in its possibilities at present for the same reason that a universal language is improbable. Only by the gradual dominance of some existing system will we arrive at a common method of weights and measures. The English system has a strong hold but the obvious superiority of the metric system may conquer in time.

Banking Systems. Instead of carrying around huge sums of money to do business, our merchants deposit in banks and then draw checks in favor of the ones to whom they owe money. The one who receives a check sends it to his bank. The bank then transfers the sum from one account to the other or from one bank to another as the case requires.

Our banking systems are divided into two general classes, state banks and national banks, the former being under the supervision of the state, and the latter being under the supervision of the national government. Within these classifications occur many subdivisions and kinds of banks, each serving a distinct purpose in the commercial world.

Because of the many safeguards which surround our banks today people have confidence in them. In the banks they deposit their surplus money, for which deposits the bank sometimes pays interest. After retaining a certain proportion of the money for the usual withdrawals, the bank then loans the money to individuals and corporations for their use in extending business. For each loan the banks are paid a rate of interest. The banks make their profit from the difference between the rates they pay the depositors and the rates they receive from borrowers. In this way the surplus capital of the country is kept at work and everyone benefits. So banks aid commerce by furnishing large capital when necessary and keeping the money of the country in circulation and working.

Negotiable Instruments. Negotiable instruments such as checks, drafts, and promissory notes have a large and important place in commerce and industry today. Man has built up confidence to a degree that daily millions of dollars pass in business on paper only. Down through the years, customs and rules about this branch of organization have become universal and well known and now a large part of our transactions are carried on in such a way that payment is made only by scraps of paper at the time, scraps of paper which represent many thousands of dollars. If a person wishes to find an example of faith in his fellow men he has but to witness the credit extended on negotiable instruments daily by the business men who regard this means of doing business as the ordinary one, not extraordinary.

(Keystone View Company, Inc., N. Y.)

FIG. 48. THE NEW YORK STOCK EXCHANGE

Business Organizations. With the coming of big business during the last one hundred years, have come also new ways of association in business. Formerly business was conducted by a sole proprietor or by partners. But as the demands became stronger and stronger for some form of business organization whereby several men could combine their capital into one venture without the risks attached to partnership, we see the birth and growth of the corporation form. In a partnership a man runs many risks and is responsible personally for the debts of the firm and the financial acts of his partner for the firm. Partnership also has its legal limitations in regard to continued existence upon the death of one of the partners, the government of the concern, and many other phases distasteful to business men, which would defeat the coöperation of many who did not know and rely on the honesty of the others.

In corporations many may be stockholders, some in small lots, others in large lots. No danger is attached personally to the mismanagement of the corporation, the corporation being a legal person in its own name. All the stockholders might die but the corporation would continue its existence, the new members being those who inherited the stock. The corporation sues and is sued as a legal person and the stockholders can not be reached. In fact a stockholder may sue his own corporation. This form of business organization became popular and led to the formation of many large companies capitalized at millions of dollars. It made possible the pooling of many small money surpluses into one great sum. The corporation is a result and a necessity of the big business of today.

Labor Organizations. As men specialized in the different trades, organization of the tradesmen into groups or guilds having the same interests became common. These guilds took over the control of their trades and played an important part in commerce and industry. The Industrial Revolution affected the labor organizations in England immensely and a study of labor conditions there shows the great effect of labor organizations on industry.

In the United States labor organization did not take on importance until after the Civil War. We find the Railway Brotherhoods organizing in 1863. After the war, many local trade unions, composed of men skilled in the same trade, were formed and then united into national trade unions. Attempts to combine national organizations of different trades failed. An organization known as the Knights of Labor arose, first as a secret society, and later as an open one. It was the ambition of this society to organize all labor into one large organization. For a few years it grew rapidly but during the ten years from 1880 to 1890 it lost its hold on the labor public because of politics and several disastrous strikes, and its leadership passed to the American Federation of Labor.

This present organization is a federation of labor organizations. It has succeeded because it has a strong type of organization, avoids politics, and is against local interference, believing in a non-centralized government as far as possible. By its sane and conservative attitude it has won the respect and confidence of its members and the public in general. All labor organizations, whether organized in trades unions, labor unions, industrial unions, or federations of any of these, have a deep effect on our industry and commerce in that they affect wages, hours, and the general welfare of the workingman.

TEXT QUESTIONS

1. Show why as commerce and industry become more complex organization becomes necessary. Illustrate.
2. Why are gold and silver used for money? What objection can be made against platinum? Iron? Tin? Wood?
3. Name some articles that have been used for money.
4. Explain how coin money reached its present state of perfection.
5. Explain how paper money depends upon real value to make it worth anything. Illustrate how paper money can become of no value.
6. Why is paper money so popular in commerce? Explain.
7. Define (1) legal tender, (2) deflation, (3) inflation, (4) rate of exchange.
8. Compare our system of weights and measures with that of the metric system. What advantages has the latter? Why do we not change to the metric system?

9. Explain how surplus money of depositors is used to create and increase our commerce and industry.
10. Into what two general classes are banks divided? Who supervises each kind?
11. Why is a bank like a money merchant, buying money from the depositor and selling it to the borrower?
12. Look up a good definition of "negotiable instruments." Be able to explain it fully.
13. Give the good points of the corporation form of business organization. The bad points of partnership organization.
14. Show how the corporation form of organization is necessary to raise the large amount of capital needed to carry on big business of today.
15. How does the American Federation of Labor affect our commerce and industry? Explain fully.

PROBLEMS AND PROJECTS

1. Prove that the business of today is built on the axiom, "Honesty is the best policy."
2. Make a list of all the organizations in your locality that affect local commerce and industry.
3. Make a list of all the various kinds of money in circulation in the United States.
4. How many in the above list are promissory notes? How many are certificates of deposit? How many are legal tender?
5. How many kinds of our money are token money? Credit money?
6. Make a list of the different kinds of standards we use in weighing and measuring in our business relations.
7. Describe the metric system fully.
8. Who regulates the correctness of the scales in your locality? How can you find out whether scales have been tested?

9. Make a list of all the different kinds of banks in your community and tell how each kind serves a special purpose.
10. Why do savings banks pay a higher rate of interest than checking banks? Explain.
11. Make a list of the various negotiable instruments.
12. Find out all you can about the American Federation of Labor and show how it benefits labor in general.

TOPICS

1. The craft guilds of the Middle Ages.
2. Organized labor after the Industrial Revolution in England.
3. The metric system.
4. Banking in the United States.
5. The Federal Reserve Bank system.
6. The origin and growth of negotiable instruments.
7. The Knights of Labor.
8. The Industrial Workers of the World.
9. The American Federation of Labor.
10. Employer associations.

FOR CLASS DISCUSSION

1. Labor should have a larger share of the profits.
2. The metric system should be made compulsory.
3. A high protective tariff is better than a tariff for revenue only.
4. High wages and high prices are to be preferred to low wages and low prices.
5. The economic status of labor is improving.
6. Compulsory arbitration of labor disputes should be made law.
7. All banks should be regulated and supervised by the national government.

PART II—MATERIAL FACTORS

- Material Factors
  - Vegetable
    - Cereals
      - Wheat
      - Rice
      - Corn
      - Miscellaneous
    - Beverages
      - Coffee
      - Tea
      - Cacao
    - Sugars
      - Cane
      - Beet
      - Maple
    - Plant Products
      - Tobacco
      - Vegetables
      - Fruit
      - Miscellaneous
    - Forest Products
      - Lumber
      - Paper
      - Rubber
      - Miscellaneous
    - Vegetable Fibers
      - Cotton
      - Flax
      - Miscellaneous
  - Animal
    - Animal Fibers
      - Silk
      - Wool
      - Miscellaneous
    - Cattle
      - Meat Packing
      - Leather
      - Dairying
    - Miscellaneous
      - Poultry
      - Fisheries
      - Furs
  - Mineral
    - Non-metallic
      - Coal
      - Petroleum
      - Building Materials
      - Miscellaneous
    - Metallic
      - Iron and Steel
      - Precious Metals
      - Miscellaneous

CHAPTER XI

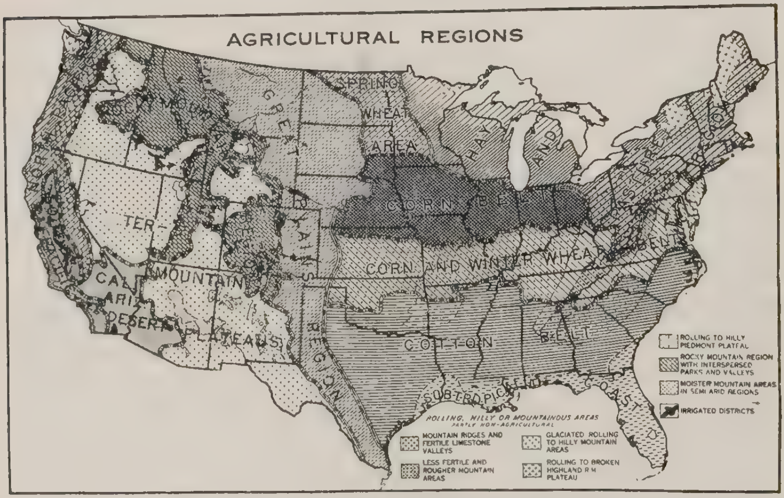
CEREALS

SECTION 1—WHEAT

History of Wheat. The use of wheat as a human food goes back far beyond written history, but it is generally agreed that its place of origin was western Asia. That it was used by primitive man in the years preceding the dawn of history is proved by the discovery of grains of wheat in the traces we find of prehistoric man. Wheat has been found in the ruins of the Swiss lake dwellers, a race of men who existed many years before written records appeared. We know that wheat was cultivated in China at least 3,000 B. C. and records in the pyramids tell us that it was popular among the ancient Egyptians. The Bible constantly refers to wheat, its first reference occurring in Genesis. It is probable that the "corn" of Joseph's time was wheat. The corn ships of Rome were laden with wheat.

There seems to be no ground for believing that wheat was known in the Americas before the advent of the Europeans. The Spanish introduced it in the south, while the first record of its cultivation in the north was in Massachusetts, by Gosnold. Up to the Revolutionary War the cultivation of wheat in the United States was confined to the original thirteen colonies. After the Revolution its cultivation began a westward march and the completion of the Erie Canal found the center of the wheat industry in western New York and Pennsylvania. As the pioneers pressed westward, the center of wheat production followed them and in 1880 it crossed the Mississippi River.

The increase of intensive farming in the East has curtailed the amount of land available for large wheat crops there. More attention has been given to dairying and truck growing and the farms have become smaller. Then, too, some of the eastern farms have lost their former fertility, due to a lack of rotation of crops, and it has become more profitable to seek new lands than to raise wheat on the impoverished acres.


AGRICULTURAL REGIONS
NORTH PACIFIC
ROCKY MOUNTAIN
GREAT PLAINS REGION
SPRING WHEAT AREA
HAY AND
PASTURE
CORN BELT
CORN AND WINTER WHEAT BELT
COTTON BELT
SUBTROPICAL COAST
TER- MOUNTAIN PLATEAUS
CAL ARIZ DESERT
ROLLING TO HILLY PIEDMONT PLATEAU
ROCKY MOUNTAIN REGION WITH INTERSPERSED PARKS AND VALLEYS
MOISTER MOUNTAIN AREAS IN SEMI ARID REGIONS
IRRIGATED DISTRICTS
ROLLING, HILLY OR MOUNTAINOUS AREAS PARTLY NON-AGRICULTURAL
MOUNTAIN RIDGES AND FERTILE LIMESTONE VALLEYS
GLACIATED ROLLING TO HILLY MOUNTAIN AREAS
LESS FERTILE AND ROUGHER MOUNTAIN AREAS
ROLLING TO BROKEN HIGHLAND R M PLATEAU

(Courtesy U. S. Department of Agriculture)

FIG. 49. AGRICULTURAL REGIONS OF THE UNITED STATES

In recent years new areas have been opened up in Canada and the far western states, with a tendency to move the wheat center farther westward. As land becomes more and more valuable, however, the western wheat lands will gradually turn more to intensive agriculture and the large areas now under wheat cultivation will be split up into smaller and more diversified farms. This will have a tendency to move the wheat center eastward again. Until then cheap land and extensive cultivation will hold the wheat center west of the Mississippi River.

Growing Conditions of Wheat. Wheat thrives best in a loamy, well-drained soil. Regions where the surface is fairly level and free from trees and rocks, naturally encourages the use of machinery and extensive cultivation.

Wheat requires a cool, moist, formative period in which to germinate the seeds and start healthy stalks. This period is a crucial one, as moisture at this time increases the number of stalks, and so the final yield. Later, after the seeds have germinated and the stalks have a good start, a hot, dry, maturing period is best. This brightens the grain and prevents some of the wheat diseases such as rust and mold.

The wheat of Egypt, the Mediterranean countries, and the United States, especially the great Pacific Coast region, because of a sunny maturing period, is much brighter in appearance than that of European countries. A climate of alternating freezing and thawing is bad for wheat because by the thawing, the seeds and roots are often thrust out of the ground and then are killed by the subsequent freezing.

(Courtesy U. S. Department of Agriculture)

FIG. 50. WHEAT STACKS, CACHE VALLEY, UTAH

A long, wet winter without too much frost, followed by a cool, damp spring, and then by a hot, dry summer makes the ideal combination of weather for wheat.

Chief Varieties of Wheat. The varieties of wheat are capable of being subdivided indefinitely, but for our purposes we may divide them into three general classes.

Spring wheat is planted in the spring and harvested in July and August. This wheat is rich in gluten and makes best bread flour. It is planted in the regions where the severity of the winter makes fall planting undesirable. It is the variety that is raised throughout the northern part of our wheat belt.

Winter wheat is wheat planted in the fall and reaped in June and July, and is not so rich in gluten although it is richer in starch. It is much used in pastry and cake.

Another kind of wheat is durum wheat, which is a hardy type and grows well in regions of scanty rainfall. It is so rich in gluten that it is used extensively in macaroni making. Not only is this kind of wheat hardy but its yield is much larger than other kinds. It is fast becoming popular in the United States.

Countries of Production. Wheat production is so widely scattered that it is possible to find the harvesting of wheat in progress somewhere in the world at any time during the year. The demand for wheat flour is steadily increasing, markedly so in countries whose economic standards are advancing, and to meet this demand the wheat frontier is constantly being enlarged, even to regions that are not particularly well adapted to wheat raising.

Countries with much cheap land still available and with a relatively small population, naturally lead in the exporting of wheat to supply the demand of those countries, dense of population, where the local crop is insufficient to meet the demand. The number of bushels per acre is much smaller in new countries where land is cheaper, intensive cultivation being necessary in countries where land is of high value. However, this low yield per acre in new wheat areas is more than compensated for by the use of machinery which enables the farmer to produce wheat more cheaply.

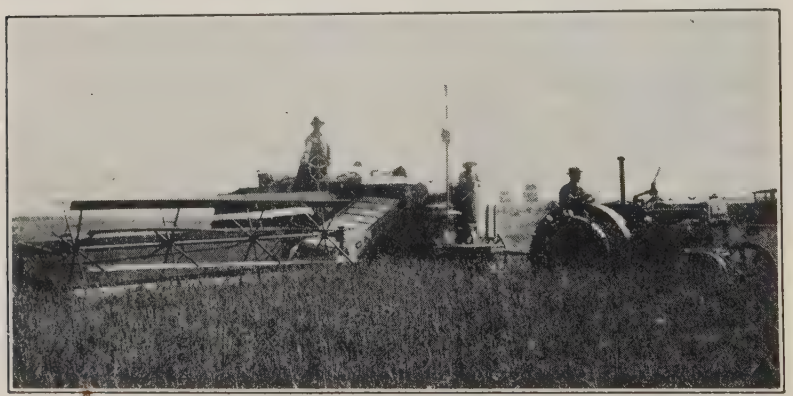
Wheat in the United States. The United States leads all other countries in the production and exportation of wheat. Conditions here are ideal for extensive wheat culture. The vast prairies of comparatively cheap land, free from rocks and trees, and in little need of fertilizer for some time to come, encourage the operation, by the use of machinery, of large farms. The people of the United States are of a type that can invent and use machinery to its best advantage. Although the home demand for wheat is great, there still remains much of the crop for export. As the population here increases, however, the demand will grow, and gradually exportation will decrease. This decrease in exportation will be taken care of by Canada, Russia, and Argentina.

The long haul from our western wheat farms to the ocean ports is a distinct disadvantage to us, but the wonderful facilities in transportation by rail and by the Great Lakes, coupled to the ingenious devices for handling wheat in bulk at the terminals, enable us to compete successfully in the European markets. Our western ports form an outlet to the Orient, where the wheat demand is steadily growing. So diverse are the climatic conditions in the United States that almost all varieties of wheat find here a habitat. These wheat belts will be discussed in another paragraph.

Wheat in Russia. Prior to the World War, Russia was a close second to the United States in acreage, production, and exportation of wheat. In fact in some years she led the world. During the war her outlets were blocked and her wheat export to the nations of western Europe, who especially needed it, became impossible. Later her internal and political troubles not only cut down the supply available for export, but did away with the large part of her production, so much so that she was reduced to the starvation point and had to be fed by America's bounty. Under the present government, Russia has not yet returned to her previous production, although she is beginning to produce more and more, and will probably return to her former status.

Russia could be the greatest wheat grower in the world. With modern machinery and intelligent methods, she could greatly increase the yield per acre, which has always been the lowest in the world. Much of her available wheat lands in Siberia have never been cultivated. Good transportation facilities will open up this great wheat field. The loss of the Russian wheat supply, during the war and after, was met principally by the United States, Canada, and Argentina. These countries increased their production to a point where the world demand was met. What the effect on wheat production will be when Russia regains her place as a wheat grower, forms an interesting problem.

Wheat in Canada. Canada has rapidly advanced in recent years to second place in world production of wheat. As her supply greatly exceeds her demands, she is second only to the United States as an exporter. Her great wheat regions lie just north of the wheat regions of the United States, in Saskatchewan, Manitoba, and Alberta. Here the climatic conditions are favorable, the soil and topography lend themselves to the extended use of machinery, and the longer growing day, due to the more northern latitude, causes rapid growth.



(Courtesy Canadian National Railways)

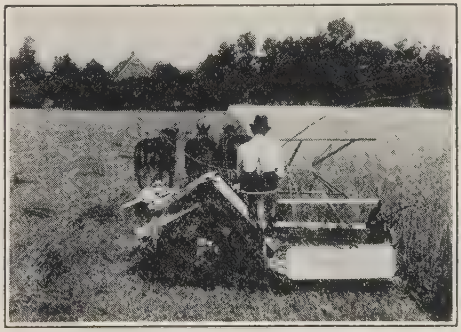
FIG. 51. HARVESTING WHEAT IN CANADA

Canada's people are of the same type as the Americans, and employ the methods used in our own wheat regions. Canada's railroad facilities are well planned and operated, and water transportation via the Great Lakes is available. Some wheat is now moving out through Hudson Bay where it can be exported before the ice forms.

Wheat in India. The third country in importance in wheat production is India. Most of this wheat is grown in the northwestern part of India, much of it under irrigation. It is grown on small patches of land by small farmers, using crude and old methods of culture and threshing. As a result, it reaches the European market in a very poor condition, full of chaff and dirt, and poorly graded, and brings a much lower price than that of its competitors.

The amount of the crop varies from year to year, being determined somewhat by the amount of the other cereal crops and somewhat by climatic conditions. The quantity exported varies also. In times of prosperity it is larger, and in times of crop failures, especially of other cereals, it is smaller. It averages about one-sixth of the quantity produced. England is the chief country of import.

Because of the hot season, which brings many insects to destroy the wheat crop, it must be harvested very quickly when ripe. This crowds the transportation and terminal facilities, and also tends to lower prices.



(Keystone View Company, Inc., N. Y.)

FIG. 52. GERMAN FARMER CUTTING WHEAT WITH AN AMERICAN HARVESTER

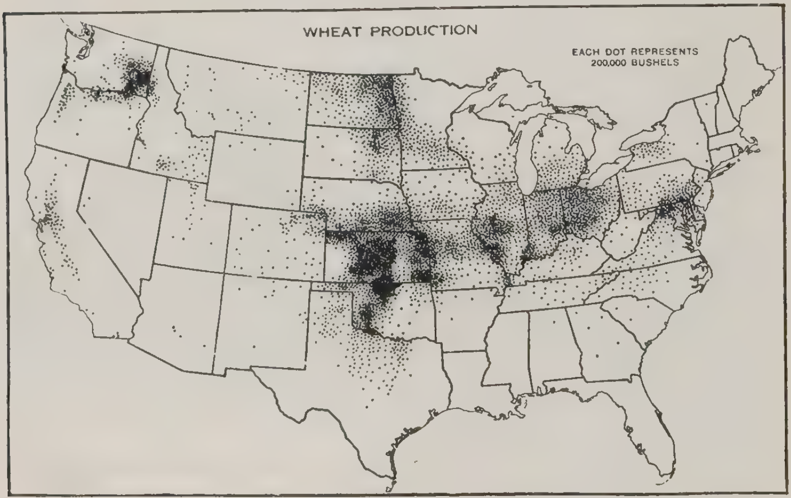
Wheat in European Countries. The European countries, especially France, Spain, and Italy, are large wheat producers, but because of their dense populations and large industrial centers, are also large consumers of wheat, and so become importers.

Here we find a very intensive system of wheat culture because of the scarcity of land and its high value. The highest average yield per acre in the world is found in northwestern Europe. France, with an area smaller than Texas, and only one-eighth of it planted to wheat, is the fourth country, and in some years has ranked third, in amount of wheat produced.

Durum wheat finds much favor in France and is the most popular variety raised. Modern methods are used in cultivation and some machinery is used, especially in harvesting.

Wheat in Argentina. For the country fifth in importance in wheat growing, we go into the southern temperate zone, and find Argentina. This country is comparable to the

United States in the extent and topography of its wheat regions. Its climate and soil are favorable to wheat growing. Argentina has been retarded as a wheat grower because of its large estates, absence of transportation facilities, lack of capital, and inferior type of laborers. The yield per acre here, next to Russia, is the lowest in the world.



(Courtesy U. S. Department of Agriculture)

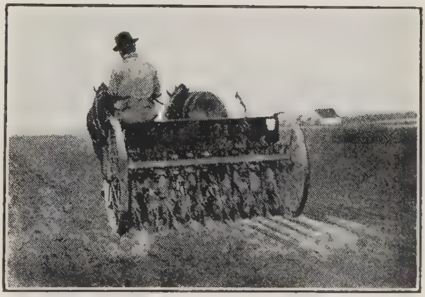
FIG. 53. DISTRIBUTION OF WHEAT PRODUCTION

As the wheat demand of the world grows, the wheat production of this country will improve and increase. With good transportation and terminal facilities, modern methods, and more intelligent operation of its wheat fields, Argentina can and will become one of the leading wheat producing countries of the world. Because of its sparse population, it is now one of the leading exporting nations, and as such, ranks third.

Australia, while comparatively low as a wheat producer in comparison with many other countries, ranks fourth as an exporter because of her small population.

Wheat Belts in the United States. Wheat is grown in forty-three states, but its production on a large scale occurs only in certain areas. Beginning at northern Texas, and running within the twenty-inch rainfall line north into Canada, lies the chief region of production. Here the growing conditions for wheat are ideal. The rainfall is neither too much nor too little. The soil is right and the character of the surface favorable to large scale operations.

The states in the northerly section of this belt, North Dakota, South Dakota, Minnesota, Wisconsin, and Iowa, grow spring wheat because the severity of the winters discourages fall planting. Kansas, Illinois, Indiana, Missouri, Ohio, and Oklahoma, in the southern section of the belt, grow winter wheat because the winters are mild and allow the fall planting of seed and early growth in the spring.



(Courtesy U. S. Department of Agriculture)
FIG. 54. PLANTING WHEAT

Another wheat belt in the United States is found in Oregon and Washington. While the rainfall here is scanty, it is sufficient and comes at the right time. Here, as in California, we find the Mediterranean type of climate which is so favorable to bright, hard wheat. So dry is the wheat at harvest time in these sections that the grain can be cut and threshed direct from the plant without any delay.

The Eastern states, while growing wheat to some extent for local supply, do not enter into the wheat production nationally.

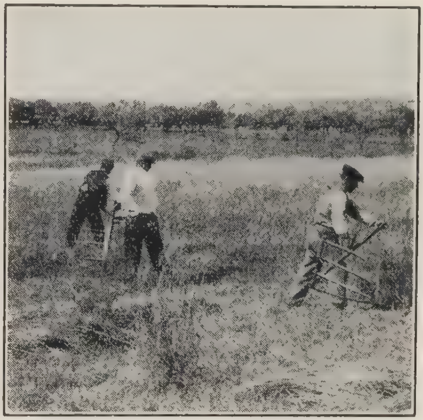
Wheat Planting. Just as the various factors enter into the world distribution of the production of wheat, so also do they determine the methods employed in production. We find all kinds of methods, from the most primitive to the most modern. In the backward countries, where man power is cheap, we find wheat planting still done as it was centuries ago. Crude wooden plows or bent trees, drawn by all kinds of animal power, are still used to break up the soil.

Contrasted to these ancient ways are the up-to-date methods employed in the United States. In the smaller fields of the eastern section, steel plows drawn by two or three horses are used. In the wheat states, riding or sulky plows are used. On these the rider has a seat and directs the horses from it. On the great wheat farms, these sulkies sometimes have two and three plows and are drawn by four and five horses. Where the planting is on a very large scale, tractors are used to drag gang plows, which consist of from six to twelve plows and which make as many furrows at the same time. After plowing, the earth is generally broken up into small particles. This is done by the tooth harrow, which is a large frame with spikes in it, or by the disc harrow, which resembles several steel pie plates set on edge.

When the soil is ready to receive the seed, it is planted in two ways. In the more primitive regions it is sown by a man who, as he walks along, sows the seed by broadcasting it over the land. It is quite an art to throw the seed so it will fall evenly on the ground. After the seed has been broadcasted, it is covered by harrowing, or by brushing soil over it. Much seed is wasted by this method, as the birds eat more or less of it, and that which is not covered up dies from exposure. There are machines which broadcast in imitation of the human sower, and they are used somewhat, especially in the sections where harrows are to follow.

The most scientific way of planting wheat, however, is to use a machine which plants it in the ground. These are of two types. One machine makes a hole into which the seed runs and is then covered by the falling of the earth into the hole. The best kind of seeder, however, is one which makes a shallow furrow into which the seeds fall and are covered up by a device which also presses down the earth on them. With one of these modern seeders or drills many acres can be planted in a day, with a great saving of seed and greater assurance of a successful crop. After planting, wheat does not need weeding as the wheat comes up rapidly and the weeds do not get started.

Wheat Harvesting. The sickle was the most primitive method of harvesting wheat and was common in all regions. The harvester grasped the wheat with his left hand and cut it with the sickle in his right hand. This method of reaping is still used in many regions, especially where man power is cheap. A good worker can harvest about an acre a day in this way. After the wheat has been cut other laborers bind it in sheaves and stack it. In olden times it was customary to allow the poor to enter the field and gather up, or garner, the wisps of wheat left by the reapers. These poor people were called gleaners. For centuries the sickle was the only reaping tool.



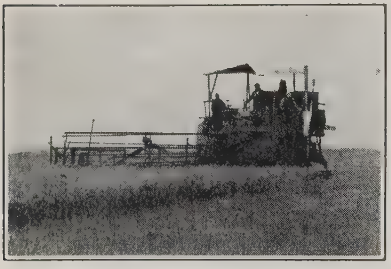
(Keystone View Company, Inc., N. Y.)

FIG. 55. HARVESTING WHEAT WITH A CRADLE SCYTHE

In the early 1800's, in America, the cradle scythe was developed. It consists of a light scythe with upright arms or fingers which permit the reaper to swing the tool with both hands, the fingers of the cradle keeping the wheat parallel as it falls into the swath. This greatly increased the speed and ease of reaping, as a good harvester could cut four acres a day in this way. The binding into sheaves was still done by hand by other laborers who followed the men with the cradles. This method is still used in many regions today, especially in those sections where the farms are too small to justify investment in machinery.

Pliny tells us of an ox drawn contrivance among the Gauls which stripped the kernels of wheat from the stalks. This device seems to have disappeared, and it was not until the early years of the last century that interest began to be shown in the invention of some kind of a machine which would reap wheat.

The first successful reaping machine seems to have taken the old idea of the Gauls into consideration and worked as a header in the fields, leaving the stalks. Finally, McCormick was successful in bringing out a machine which cut the wheat and delivered it onto a platform, from which it was raked into bundles and bound by hand. The next step was to invent some means of mechanically binding the wheat into sheaves or bundles, and right after the Civil War we find such a device which took the bundle, bound it with string, tied the knot, and threw it off. From then on the history of harvesting machines has been one of steady improvement.

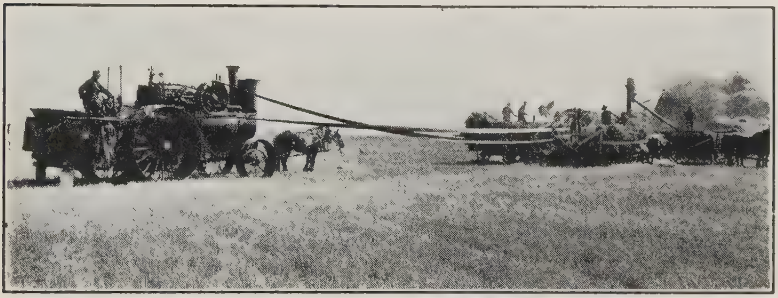

(*Courtesy U. S. Department of Agriculture*)
FIG. 56. HARVESTING WHEAT WITH A COMBINED REAPER AND THRESHER

Among the horse-drawn types, we find two types of harvesting machines; one which merely cuts off the heads of the wheat, and one which cuts the entire stalk. The latter is more popular. There are machines which merely cut the wheat but do not bind the bundles, and other machines which cut and bind the bundles. On the large wheat fields of the dry belt in the far West, where the wheat dries on the stalk, we find machines which cut off the heads of the wheat, thresh the wheat, weigh it, and pack it in bags.

On most of our wheat farms we find the harvesting done by the reaper and binder type of horse-drawn machine. The bundles are collected and placed in piles and allowed to dry until they are ready for the threshing machine.

Threshing. In the separation of wheat from its stalks we find also a large advance and divergence in methods. The old and primitive way was to drive animals over the wheat laid down on threshing floors made of hard earth or stones. In this way the heads of the wheat were separated from the stalks by the constant beating of hoofs. Sometimes a dray was pulled around over the wheat. These methods were supplemented by men beating the wheat with flails, which were two sticks joined together with a strap. Flailing wheat was the most general custom of threshing for centuries.

All of the above methods are still used in some regions today, and a visitor to the Near East will see the same methods in use there now as were in use in Biblical times. After the wheat had been separated, it was winnowed by throwing it into the air and depending upon the breeze to blow away the dirt and chaff. Paddles and shovels were used to throw it and gradually the grain grew into a heap of fairly well sifted wheat after several winnowings.



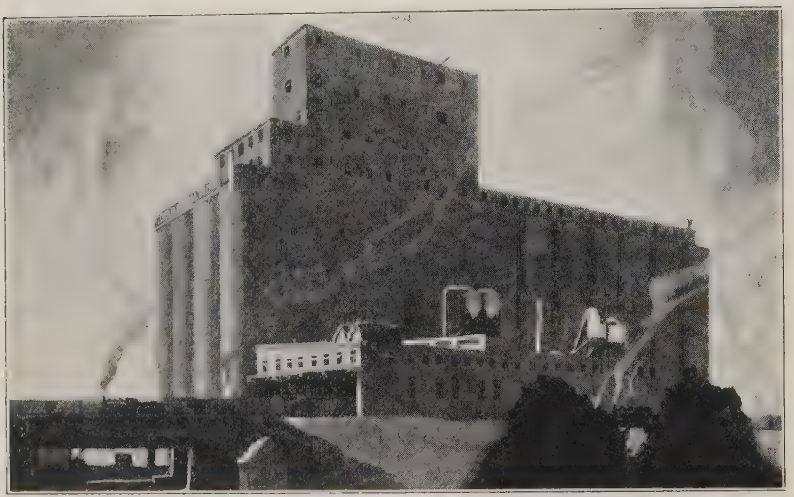
(Courtesy U. S. Department of Agriculture)

FIG. 57. WHEAT THRESHING IN MONTANA

In the more modern countries machines called threshers are used. These are large machines which go from farm to farm threshing the wheat of each in turn. The power used to run these threshers is generally steam, the fuel often being the waste straw and chaff. A threshing crew accompanies the machine, some men being used to operate the machine itself while others bring the bundled wheat on carts to the thresher and haul away the threshed grain. The wheat is fed into the thresher which threshes it, cleans it, weighs it, and pours it out into the waiting carts ready for the grain to be taken to the grain elevators.

Wheat Storage. From the threshers, wheat is generally taken to the wheat elevators near the railroad where it is stored, awaiting transportation. Upon arrival at the local elevator, the wheat is graded and a receipt given the farmer for it. The receipt is cashable at any time by the elevator companies, its value depending upon the market price of wheat on the day it is cashed.

Large wheat companies now take the wheat from the local elevators to centralized shipping points. At the great shipping centers we again find grain elevators, only this time they are immense in capacity. Here the wheat is stored until ready for a shipment, when it is loaded into ships by gravity. Ships are unloaded by using the vacuum principle, the wheat being sucked up through large tubes.



(Courtesy Washburn-Crosby Co., Inc.)

FIG. 58. TERMINAL GRAIN ELEVATORS

Flour Making. Prehistoric man first ground wheat into small particles by his teeth, but other ways of grinding wheat were soon invented. The simplest device is a hollowed stone in which the grain is placed and then pounded with another stone. A step in advance of this is a device called a mortar and pestle, which consists of a bowl, either of rock or wood, and a pounder with a handle.

In many parts of the world a quern is used. This consists of two stones so connected that the upper stone revolves on the lower stone. Into the upper stone a handle is placed near the edge, and in the center a hole is cut through to the lower stone. By grasping the handle and moving the upper stone in a semicircular motion, the wheat, which is fed in through the hole in the center, is ground between the stones and comes out at the edge. This device sometimes is so large that cattle are used to turn the stone.

Millstones were another step in the grinding of flour and, while working on the same general principle as a quern, were much superior in that they were larger and so grooved that they cut the grain and crushed it into much smaller pieces. Using this method small mills sprang up near centers of population and community milling became popular, the miller extracting a toll of wheat for each bushel ground. These mills were known as grist mills.

As wheat production grew and new inventions and methods were introduced, resulting in our modern system of milling, these small mills gradually gave way to the large flour mills of our day. This resulted also in the centralizing of the industry into a few milling centers.

Budapest first introduced the modern roller method of grinding wheat and America at once took it over and improved it. Under the old method of grinding by millstones, the stones were set close together in order to crush the wheat as fine as possible. This resulted in a flour which had much bran and other impurities in it. Hard wheat did not mill well this way and soft winter wheats were much more popular. By the roller method the grain is gradually reduced, being constantly purified as reduction proceeds. This gives a much purer and better flour. It also enables the miller to use hard spring wheat and from it get a very superior flour. Thus this process meant much to the great regions of our west, which are mainly spring wheat growers.

Milling. The first process in a modern mill is the cleansing of the wheat. This is done by passing it through various machines which sift out the dirt, weed seeds, and other undesirable matter which is mixed in with the wheat. Another machine also brushes the beards and fuzzy materials from the seeds. The wheat is then tempered by various means so that it will grind better. It then passes through several iron rollers which break it into smaller and smaller particles. After each succession of rollers it is sifted or bolted through silk screens, that which passes through being called middlings and that remaining passing onto the next breaker. In this way the inner part of the kernel is broken into flour while the outer covering, called bran, and the germ passes along. After the last breaking or grinding, this is sold as a stock food.

The middlings, that powdery result of grinding and sifting, are again purified by passing through a machine, called the middling purifier, which separates the flour from the tiny pieces of bran and dirt. These purified middlings are ground again several times, each time being sifted and purified, until they reach the final state of pure fine flour. The flour is not pure white direct from grinding. It takes two or three months for it to whiten. It is whitened at the mill by a simple chemical process which does it no harm.

Milling Centers. When western New York became the center of wheat production, Rochester became an important flour city and has retained its importance even with the western march of wheat growing. It has abundant water power, good transportation facilities from the wheat field via the Great Lakes and Erie Canal, and ready access to the great markets of the East. Buffalo and Niagara Falls also are important centers of flour milling for the same reasons.

When spring wheat became popular, because of the inventions which made its reduction into flour commercially advantageous, we find Minneapolis growing in importance as a flour city and at present she leads the world in this line. Her water power, her proximity to the spring wheat fields, and her fine transportation facilities are factors in her growth and supremacy. Other milling centers of importance in the United States are New York City, St. Louis, Milwaukee, and Wichita.

In Europe, Budapest is by far the largest flour city and is noted for the excellence of its product.

TEXT QUESTIONS

1. Prove that wheat was an important food in early times.
2. Discuss its importance in the Old World. In the New World.
3. Explain the westward movement of wheat in the United States.
4. Discuss the growing conditions of wheat. The effect of climate (1) in the formative period, (2) in the maturing period, (3) on the kinds of wheat grown in certain regions.
5. Name the three principal kinds of wheat and give their characteristics.
6. Contrast wheat growing in densely and thinly populated regions.
7. Explain the increasing demand for wheat in the world.
8. Give reasons why the United States is a large producer.
9. Will our exports increase or decrease? Why? Results?
10. Why is Canada a great producer? Exporter?
11. What influences wheat production in India? Its export of wheat? The prices for its wheat exports?
12. Discuss wheat production in Russia—past, present, and future.
13. Explain the wheat situation in European countries.
14. What hinders wheat production in Argentina? Why is it a large exporter?
15. Locate the spring wheat belt in the United States. The winter wheat belt. What is the reason for the existence of these belts?
16. Why is durum wheat popular in some regions?
17. Why can wheat be threshed in Oregon and Washington immediately upon harvesting?
18. Contrast methods of handling wheat going to the Orient and to Europe.
19. Name and locate leading milling centers.
20. Why are some of these prominent in flour making?

SECTION 2—CORN

History of Corn. When Columbus discovered America, he found the natives eating a cereal which was new to the Europeans. In America we call this cereal corn, but in other parts of the world it goes under different names, such as Indian corn, maize, Egyptian corn, Turkish corn, mealies, and dhurra.

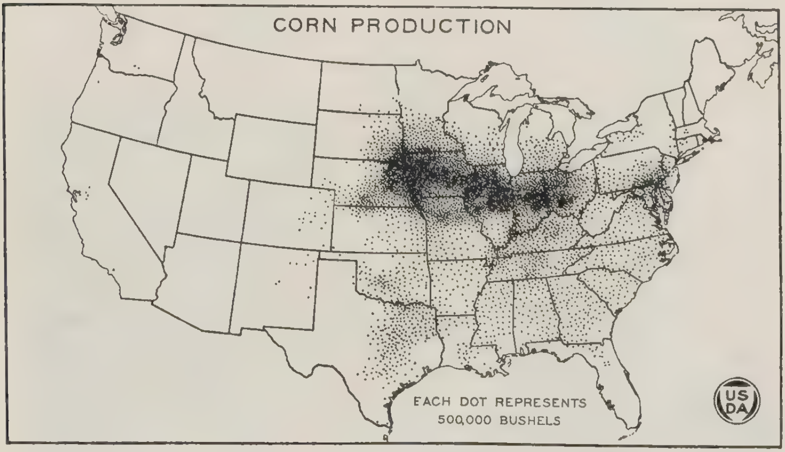
The word corn, when exactly used, means grains of all kinds, and this explains the use of the word in Biblical and historical references. It was natural, however, that the early American colonists should gradually narrow its broader meaning to their principal cereal, so that here it has lost its original meaning and is restricted to one class of corn, Indian corn. Recent findings, in ancient ruins in America, prove that it was in use here for centuries before the advent of the Europeans. It was the principal cereal of the Indians.

To the early colonists it was particularly valuable and tided them over what otherwise would have been a serious food shortage. From the Indians they learned how to plant and cultivate this new cereal which could easily be grown in half-cleared fields and whose yield was much greater, in proportion to labor involved, than that of any of the other grains. Its cultivation spread to Europe and then all over the world where growing conditions were favorable.

Growing Conditions of Corn. Corn thrives best in temperate climates. It requires a long growing period, varying from four to five months, during which time it must be frost free. Ideal conditions call for warm nights with sunny weather. The soil should be a well-drained loam. Argentina, the Danube valley in Europe, and the corn belt of the United States furnish the best natural locations for corn, combining, as they do, all the above factors.

Regions of Corn Production. The United States exceeds by a large amount the combined production of the balance of the world. Corn is also an important crop in the countries of the Danube Valley, in Mexico, Argentina, Egypt, and in southern Europe. In Mexico it is made into cakes called tortillas which form an important part of almost every meal of the poorer classes. In Italy it is made into a porridge called polenta which is a universal dish in that country.

The corn belt in the United States extends northward from the Gulf of Mexico to Canada. The leading states in production in this belt are Iowa, Illinois, Nebraska, Missouri, Indiana, and Ohio. Here the growing conditions favor large commercial crops. There are favorable conditions for growing corn in the South and much is now being raised there although cotton is the more common crop.



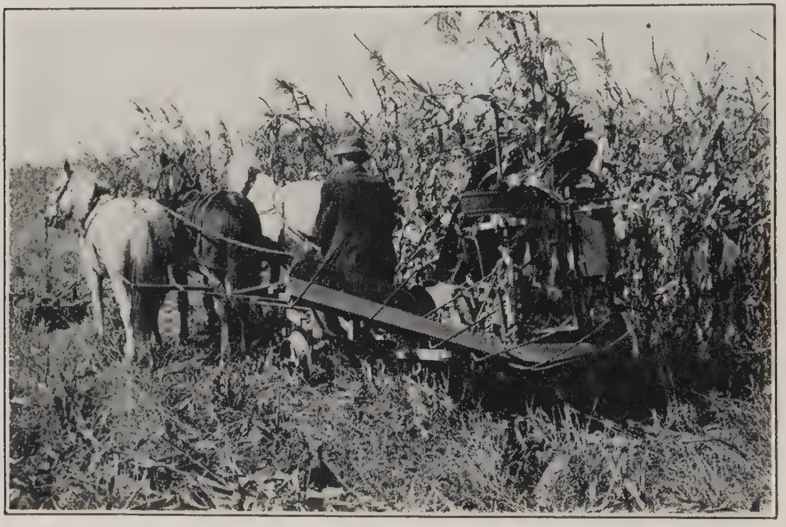
(Courtesy U. S. Department of Agriculture)

FIG. 59. CORN PRODUCTION

The corn grown in the corn states of the United States exceeds in value all our other cereals combined, and is worth more than the yearly products of our gold and silver mines. Most of the tremendous crop is marketed in the form of fattened livestock and the corn states are also the great livestock states.

Cultivation of Corn. The land selected for a corn crop is usually plowed in the spring and planted as soon as danger of frost is past. Corn is planted by a corn driller which makes a hole, drops in and covers the seed, and stamps down the earth. Corn needs cultivation to keep down weeds.

In drilling the corn seed into the ground, the rows are spaced from three to four feet apart, and the seeds dropped so that when the plants come up they will be spaced the same in all rows. This permits a horse drawn cultivator to go between the rows and by proper spacing hoe out all the weeds without injuring the corn plant.



(Photograph by Ewing Galloway, N. Y.)

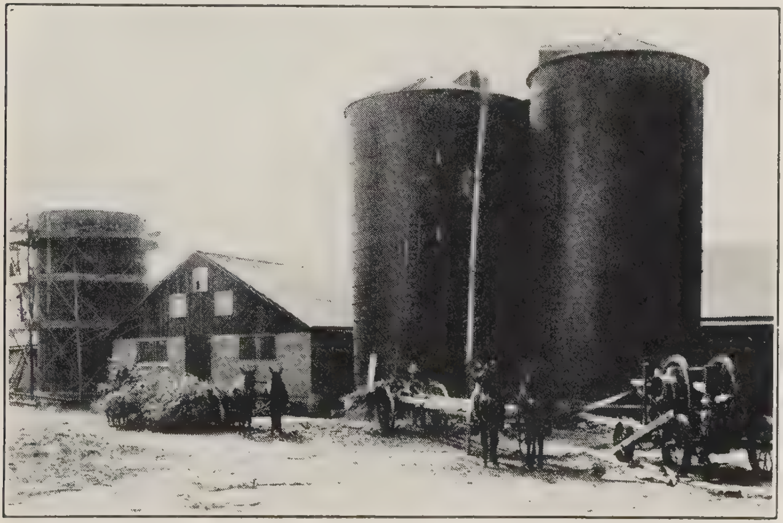
FIG. 60. HARVESTING CORN

Corn grows rapidly and soon reaches its height of from six to fourteen feet, depending upon the kind of corn and the growing conditions present. Great care is taken to select the best seed from the previous harvests and by this means the quality of the corn crop is steadily improving.

Harvesting Corn. Corn is usually harvested by hand. The laborer may first cut the stalks and stack them together to afford protection from the wind and rain and later strip off and husk the ears; or he may husk the ears while the corn is standing in the field.

There are corn cutters in use, some of which cut the stalks and stack them by power, while others pick off the ears in addition. The use of these machines is growing, but because of the nature of the corn it is difficult to invent a satisfactory machine.

Green corn, including the stalks, leaves and ears is frequently ground up into small pieces and hoisted into a large circular building called a silo, where it is stored as winter fodder for livestock. This fodder is called silage or ensilage.



(Photograph by Ewing Galloway, N. Y.)

FIG. 61. FILLING A SILO

By-Products of Corn. Practically every part of the corn plant is used, either as silage or in some by-product industry. From the cob we get fuel and the corn cob pipe. From the seed or kernel come cereals and breakfast foods, corn meal, poultry feed, hominy, alcohol, starch, glucose, grape sugar, syrups, cooking oils, and a fine grade of oil for machinery, and synthetic rubber, from which most of our pencil erasers are made.

From the stalk and leaves, we get cellulose, out of which films, smokeless powder, paper stock, and fertilizer are made. The principal by-product of corn, however, is the livestock which fattens on it. About 80% of our corn crop is fed to animals and reaches the market in the form of meat. Another by-product of corn is the sweet corn which is a favorite market commodity for the short season during which the kernels have reached their normal size but have not yet become hard. Much of this sweet corn is canned and forms an important dish throughout the year.

Pop corn is another corn, this particular kind of corn catering to a special confectionery market.

Commerce in Corn. The United States produces four-fifths of the world crop of corn, growing over 3,000,000,000 bushels annually. Most of this great corn crop is consumed in the United States, less than 1% being exported to other countries in the form of corn. Its great commercial value to us is its food value for farm animals. It is only in the southern states that it is important as a human food.

The Mexican and Central American corn crop is consumed locally as is also the southern European crop. Argentina, although her crop is small in comparison with ours, exports almost twice as much. This is because her grazing facilities for livestock are almost unlimited. Her crop is exported to European nations, principally for animal feed.

Russia and the countries of the Danube Valley export a considerable percentage of their crop, which is small in comparison to the world crop. Corn does not figure as an important article in international commerce because most of it is consumed near the place where it is raised. It is rather bulky for its food value and has a tendency to spoil easily. It is also subject to post-harvest pests like corn weevils, which spoil it after it has been marketed.

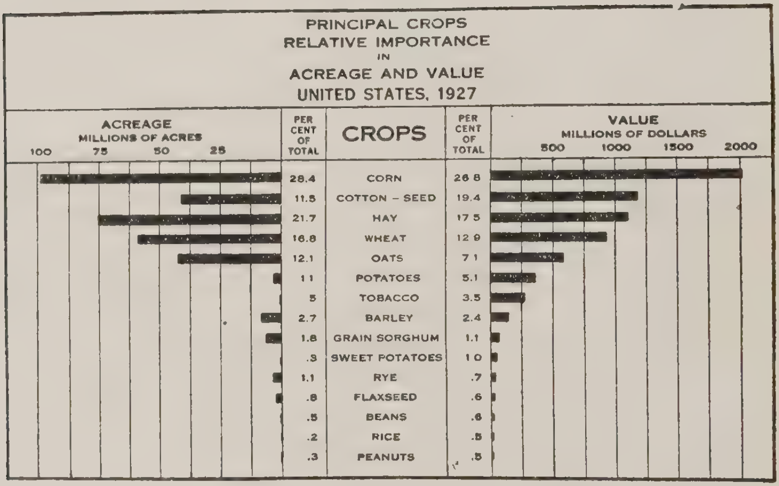
Exportation of corn from the present corn growing countries will decrease as the density of population and the meat demand increase. Because of its cultural requirements there are few fields left, and increased production is possible mainly through more intensive cultivation and more hardy types of corn.

TEXT QUESTIONS

1. Explain the use of the word "corn" in ancient historical writings. In England. In America.
2. Where did corn first become known to the civilized world?
3. List some of the other names by which corn is called.
4. Show how corn was particularly valuable to the natives of America. To the early colonists.
5. Point out five regions outside of the United States that are important corn growers. Show how each is favorably located for corn.
6. Locate our corn belt in the United States. Name the leading corn states.
7. Compare the value of the corn crop with the value of some of our other products.
8. Outside the corn belt where could corn be grown successfully? Why is not more grown there?
9. Name two countries where corn is an important source of human food. Can you give some reasons why corn is not more popular as a human food?
10. Give the ideal conditions for growing corn. Where are these found?
11. Discuss the method of planting corn. How is it cultivated?
12. Describe corn harvesting. Its preparation for use.
13. What is silage? How is it stored?
14. Make a list of common by-products of corn, showing from what part of the plant each one comes.
15. In what form does most of our corn reach the market? Why?
16. Where is most of our sweet corn grown for canning?
17. Give the reasons why corn does not enter largely into foreign commerce. Name some exporting countries. Why are they exporters?
18. Show that corn is a valuable cereal for densely populated regions.
19. Name the ways in which our corn crop can be improved in quality and quantity.

SECTION 3—RICE

History of Rice. The origin of rice goes back farther than written history. Southeastern Asia was probably its first home. Records show that it was cultivated in China in 3000 B. C. The Greeks under Alexander the Great, in their expeditions into India, found it being cultivated there and brought home some seeds. We know that it was grown in Egypt and northern Africa in early times, although its standing as a cereal was so slight that the Bible makes no reference to it. It was cultivated in Europe soon after 1468 at Pisa, and its cultivation spread to other European countries where the growing conditions were favorable.



(Courtesy U. S. Department of Agriculture)

FIG. 62. RELATIVE IMPORTANCE OF PRINCIPAL CROPS

William Berkley grew some rice in Virginia in 1647, although its general cultivation started in 1694, when a sea captain left some rice seeds with the Governor of South Carolina. These thrived, after planting, and led to the general cultivation of rice in the lowlands of South Carolina and Georgia, and later in Mississippi, Alabama, Louisiana, and Texas.

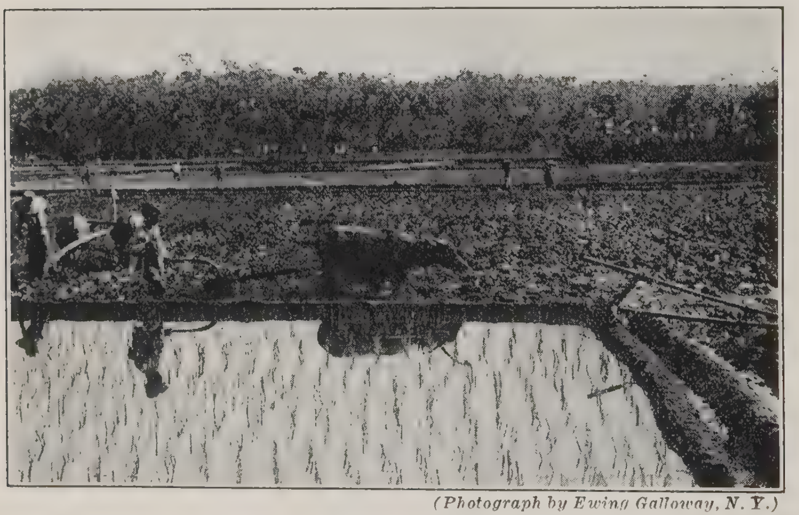
Growing Conditions of Rice. What wheat is to the temperate zone, rice is to the tropical and sub-tropical zones. The cereals of the temperate zone, wheat, corn, and the other grains, quickly spoil in the damp, humid atmosphere of the tropics. Fortunately, rice, which thrives in the tropics, also keeps well after the harvest, because of its covering which is impervious to dampness. It is the "staff of life" to the dense populations of India, China, and Japan, although there are many persons in those countries too poor even to afford it, depending on the millets which are still cheaper and which do not demand choice land.

There are hundreds of varieties of rice, although for our purpose we may divide them roughly into two kinds: the upland or hill rice, which is grown like any other cereal but is found only in sparsely settled regions; and the lowland or wet rice, which requires peculiar growing conditions and is cultivated principally in densely populated areas. Lowland rice is the kind that figures in commerce and which we shall discuss.

Rice is a cereal of only tropical or sub-tropical growth. In addition to sunshine and warmth it requires much moisture. During the growing season of ninety days, it needs at least 45 inches of water. The top soil should be bottomed with a hard clay which will retain the water on the surface. This makes possible the necessary covering of the fields with inches of water at certain periods. The warm countries of south-eastern Asia are well adapted to rice culture because of the abundant rainfall from the monsoons, and because of the river deltas. These deltas make admirable sites for rice fields, being level, easily flooded, and having proper sub-soil, with abundance of water at hand.

Rice Countries. Because of the density of population and consequent large home consumption, we frequently find that the countries which lead in a cereal production are small exporters, in fact, they may be importers from countries where a small population permits exportation. This is especially true of rice.

India, China, and Japan stand out as leaders in rice production, but because of the great local demand, appear far down the list as exporters, while Burma, Siam, and Cochin-China rank high as exporters, although far down the list as producers. The valley of the Po River in Italy, the Nile River Valley in Egypt, the United States, small areas in southern Europe, and the Philippines produce considerable rice although they do not figure as exporters in international commerce because of their home consumption.



(Photograph by Ewing Galloway, N. Y.)

FIG. 63. PLOWING A RICE FIELD IN JAVA

As the world demand for rice grows, we find new areas opening up and see the spread of rice culture into tropical and sub-tropical America and the West Indies.

Rice culture in the United States was confined for some time to the southern and eastern states, growing conditions being most favorable along the marshes on the Atlantic Coast and those states bordering on the Gulf of Mexico. It then spread to Texas where large crops are now grown. Some rice is also grown in California and Arkansas.

Cultivation of Rice. The rice of commerce is cultivated in the Far East in a very intensive way. Because of the enormous populations there, the land is very valuable, and so must be worked to its limit. The rice fields are carefully laid out in level fields and surrounded with embankments to retain the water. They are so planned that a slow flow of water can be maintained from the higher levels to the lower, in this way preventing stagnation of the water, and enabling the rice growers to use the water several times.

In comparatively level lowlands, the construction of rice fields is easier than in hilly countries where great toil and ingenuity have to be practised in terracing the slopes to create small patches of level land. Great credit must be given to the patient toilers of the Orient in the construction of these terraces and in their preservation.

After the fields have been levelled and diked, a water supply is necessary. In the lowlands, valleys, and river deltas, this water supply is found in the streams and rivers near at hand, and by proper engineering can be conveyed to the rice fields. Various methods are used to raise this water to a sufficient height to flow over the fields. Crude devices operated by man power are used for this purpose, water wheels, pumps, and even water pails being drafted into service. To supply the terraces on the hillsides, oftentimes the water is raised to the highest level by hard and arduous human labor, although sometimes a stream higher up may be diverted to the highest terrace and then led down through the lower levels by careful tending. Only a cheap and abundant labor supply makes possible this kind of rice culture.

After the field has been laid out and a water supply assured, planting can be begun. The soil is stirred up by a shallow plow, animal drawn, or is spaded up by men with heavy crude tools. Because of the smallness of the fields, the latter method is more common. Water is then allowed to flow on to the field and is mixed with dirt into a fluid mud.

The seed is sometimes sowed broadcast, but, in regions of intense cultivation, small rice plants about six inches high are transplanted by women and children who obtain them from carefully tended nurseries. These plants are spaced about ten inches apart and are set out under water.

During the early growth of the plant, the water covering the ground is frequently drawn off during the daytime to allow the warm air to reach the plants, and then run on again at night to keep the ground and plants warm. After the plants are well started, the water is kept on the land continually. The fields are carefully weeded by hand.

As the plant matures, it heads out with from 100 to 400 rice seeds, and begins to turn yellow. When the rice is fully ripe, the water is drawn off, the land dried, and the harvest begins.

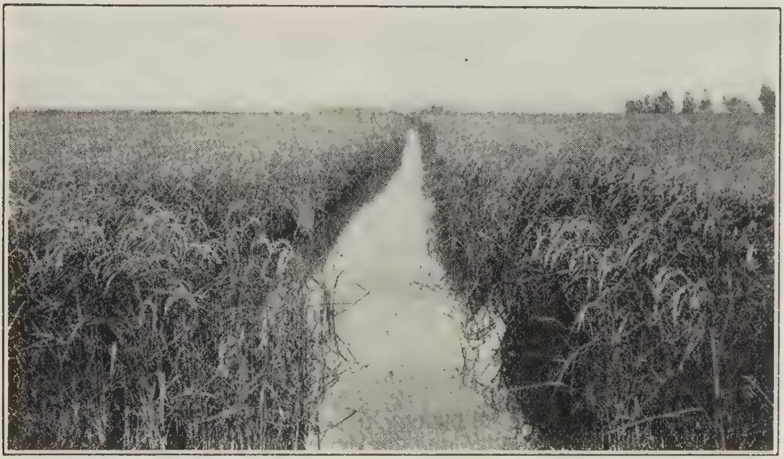
Harvesting Rice. Rice is still cut by hand in the Orient with the old-fashioned sickle. Several stalks are cut and bound together with a rice straw as a binder, and then placed in large bunches to dry. Sometimes it is necessary to build these large bunches on stick foundations to lift them from the damp or wet ground.

As much hand labor is necessary at harvest time, everybody, man, woman and child, turns out into the fields. Meals are eaten in picnic form and everyone works. After the rice has dried sufficiently it is threshed, principally by drawing the rice stalks over saw tooth edges, or nails, which pull the rice kernels from the stalks. The rice kernels are winnowed by throwing a scoopful into the air where the breeze blows away the chaff and lighter little straws, while the rice, being heavier, drops into a pile by itself.

Rice kernels are covered with a brown covering which clings to the kernel very tightly. Rice is, in the tropics, kept with the brown covering still on it, until it is to be eaten or prepared for export trade. Rice, with this covering still on it, is called paddy.

Preparation for the Market. Rice is prepared to be eaten locally by placing the paddy in large mortars and pounding it until the brown covering is worn off. It is winnowed by the breeze and cooked at once. Rice for export is taken to the exporting cities, like Bangkok, Saigon, and Rangoon, where it is prepared for the market, which demands a white, polished kernel.

In the mills which convert the rice from the fields into the finished product, the rice is first introduced into grinders which rub off the outer brown cover and at the same time blow away the rice bran. The kernels are then placed in large revolving boxes lined with sheepskin and there rubbed together until the rough outer part is smoothed off and the rice takes on the high polish that is demanded by western markets. By this last process the most valuable and nutritious part of the rice is lost; the bran and husk, although rich in food value, are used only as a cattle food, or for packing purposes.

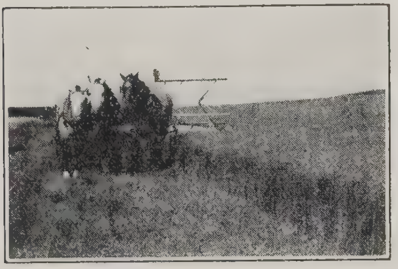


(Courtesy U. S. Department of Agriculture)

FIG. 64. GROWING RICE IN THE UNITED STATES

Rice is shipped to the importing countries in the form they desire. Unpolished rice, as used by natives, is much superior to polished rice as a food and is gaining favor in this country. Rice straw is extensively used. From it are made sandals, hats, coverings for tea chests, and mats. Various drinks are made from fermented rice, the principal one being saké.

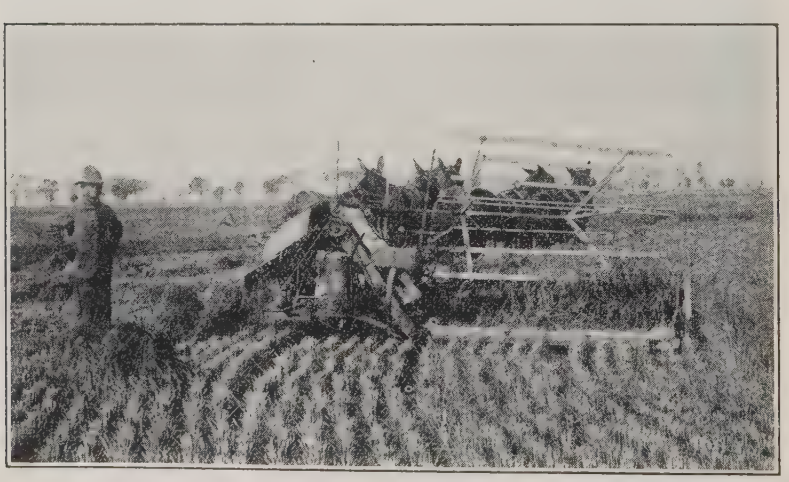
Rice Cultivation in the United States. For many years rice culture in the United States was limited to the low, swampy lands bordering the southern states, next to the Atlantic Ocean. Here the same methods were employed as were used in the Orient, the negroes supplying the cheap labor necessary.



(*Courtesy U. S. Department of Agriculture*)
FIG. 65. HARVESTING RICE IN THE UNITED STATES

Recently rice culture has received a great impetus in Texas where the almost level prairie lands are utilized. These lands have a top soil of good loam under which is a hard clay. Water is found below the surface by driving artesian wells. The warm climate is suitable for rice so we have all the growing conditions.

Unlike the Orient, in Texas we employ the methods of the wheat field. The soil is plowed by gang plows drawn by tractors and the seed is drilled by machine drillers, after which the artesian wells supply plenty of water for flooding the fields. When harvest time arrives, the water is drawn off and the ground dried so that it will support the harvesting machines, which reap the rice like wheat. It is then



(*Courtesy U. S. Department of Agriculture*)
FIG. 66. HARVESTING RICE IN THE UNITED STATES

threshed by machine threshers and bagged up ready for market. In this way the Texas farmer can grow rice and compete with the cheap labor of China and Japan.

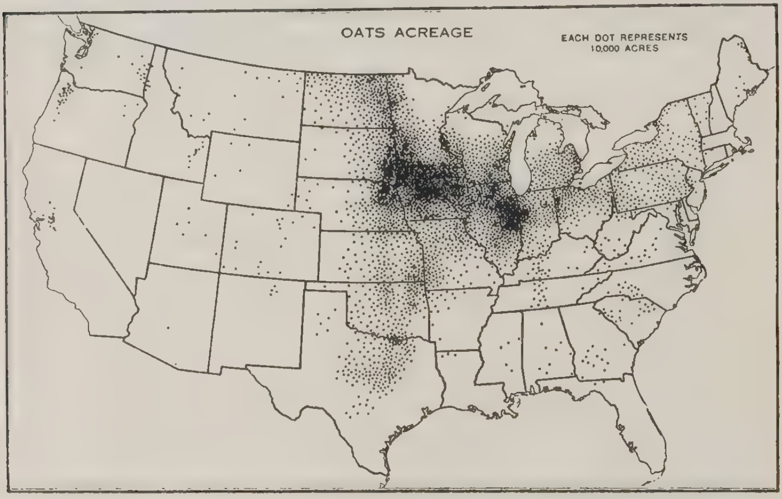
Although American labor costs much more per man, and although the yield per acre is much less here, the cost per man per bushel is much lower than in the oriental countries, because of the use of machinery. This has made it possible for rice to be exported profitably from the United States to countries with much lower wage scales.

TEXT QUESTIONS

1. Tell what you can about the history of rice in the Old World. In the New World.
2. Give the growing conditions of rice. Why is it especially well adapted to the tropical countries?
3. In what countries is rice the most important food cereal? Why?
4. Name the countries that lead in rice production. In rice exporting.
5. Explain why some of the large producers are small exporters.
6. Where is rice grown in the United States?
7. Describe methods of planting rice in the Far East.
8. Show how the importance of water in rice culture has led to very extensive cultivation.
9. Tell how rice is harvested and threshed in the Orient.
10. How is rice prepared for use in the Orient? For export?
11. Define (1) paddy, (2) saké, (3) rice paper, (4) unpolished rice.
12. Name some of the by-products of rice.
13. Contrast the methods used in Texas with those of the Orient.
14. What is the result in labor costs per bushel, when Oriental and Texan methods are compared?

SECTION 4—THE MISCELLANEOUS CEREALS

Oats. The world crop of oats exceeds that of any other cereal in amount, but is lower in value than many. Oats are used near the place where they are grown and enter but little into international commerce. This is because they are grown principally as a stock food, rather than as a human food, and because they are bulky in proportion to their weight. The use of oats in breakfast cereals is growing and their use as food in certain countries is well known. However, the great bulk of the crop is used to feed animals.



(Courtesy U. S. Department of Agriculture)

FIG. 67. OATS ACREAGE

Oats were found in the ruins of the Swiss Lake Dwellers and so were evidently a source of food to prehistoric man. Because oats could not grow in the hot, dry Mediterranean climate, we find no mention of them in the Bible and other ancient writings. We do know that they were used to some extent by the Romans to feed their horses.

Oats can stand much more cold temperature and much more moisture than wheat, in fact, oats require more moisture. Comparatively they are a quick growing crop. They are often planted in spring wheat areas in the fall, because they stand the cold of early spring and can be reaped between the planting and reaping of spring wheat crops. Oats can stand the heat of the corn belt and thrive on the moisture found there. They can be planted early in the spring and used as a dovetailing crop with corn thus enabling the farmer to work his crew continuously. Oats are found in winter wheat areas where they are used as catch crops, when the failure of the fall sown wheat is assured. In all these areas, oats are valuable as a stock food for animals.

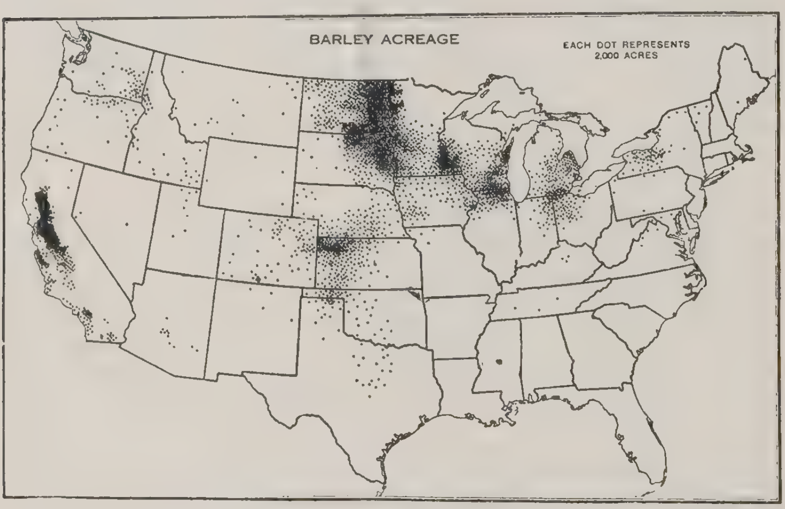
Because of the short growing season, oats are found further north than spring wheat. Oats are not so particular as to soil as is wheat, and so can be grown in areas where the soil would make a crop failure of wheat.

Barley. Barley, in outward appearance, is very much like wheat, but, because it lacks the gluten of wheat, is not so popular as a bread stuff. Barley is one of the most ancient, if not the most ancient, of known cereals. It is found in the ruins of prehistoric man and is constantly referred to in the Bible and other ancient writings. It is the hardiest of all cereals and climatically has the widest range of latitude. It is found in the Arctic Circle and in the tropics. It resists cold and drought and is prolific in its yield. Because of this it was the most used cereal in antiquity. Its drought-resisting qualities made it a crop of importance in the ancient lands bordering the Mediterranean Sea.

Barley is a quick growing crop and so is popular in regions where such a crop is desired because of the cold or dryness. In some countries of low economic standards, it is the principal breadstuff where it is made up into barley cakes and bread. Its value to health is well known, barley broth being a favorite dish for invalids, and barley mixtures being used extensively for babies.

Barley is particularly rich in fats and salts. Its principal use is as a stock food and as a basis of beer. It is particularly valuable as a stock food in those countries where climatic conditions discourage the growing of corn, especially in parts of the United States and in northern Europe.

In California barley is grown as a forage crop, being cut before it is ripe for its grass. It is also grown there for its grain. The fact that it can be dovetailed into the wheat growing period without clashing makes it a good crop for the farmer as it enables him to keep his help working on the off seasons from wheat. It is growing in importance therefore in the wheat belt. Its possibilities in the semi-arid regions of our west are great.



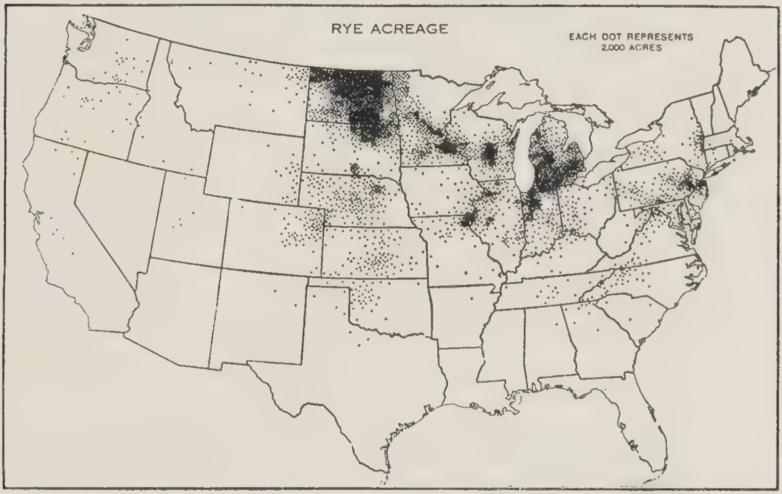
(Courtesy U. S. Department of Agriculture)

FIG. 68. BARLEY ACREAGE

Rye. Rye ranks next to wheat as a bread stuff among the European people. It resembles wheat in appearance, but is inferior as a bread maker. Rye was used by prehistoric man, but appears to be unknown to Mediterranean peoples of written history, probably because, as was the case with oats, the climate was unsuitable to its production.

Rye can grow in colder climates, on less moisture, and in poorer soils than wheat, and can withstand poorer methods of cultivation. We find it growing in Russia just north of the wheat belt, and in the spring wheat states of our country. Being hardy, it will get an earlier start than wheat, is subject to fewer pests and diseases, and forms a good alternate crop with wheat. Its ability to grow under adverse conditions makes it popular in hilly regions. The early colonists in America found it a friend because it could stand rough treatment in poorly cleared fields.

Rye is used in large part in Europe as a bread maker although it makes poorer bread than wheat because it lacks gluten. Many regions subsist almost wholly on rye bread. Most of the rye grown in Europe is grown in the northern part around the Baltic Sea. Much of the rye grown in the United States is used as stock food.



(Courtesy U. S. Department of Agriculture)

FIG. 69. RYE ACREAGE

TEXT QUESTIONS

1. Why was barley early developed as a cereal by man?
2. Give some of the leading characteristics of barley.
3. Discuss barley as a human food. As a stock food.
4. Give the leading barley regions of the world. Of the United States. Why do these regions lead?
5. Why is barley often grown by wheat farmers?
6. Locate our semi-arid regions of the west. What are the possibilities for barley there?

7. Why is the oat crop the largest cereal crop and yet the lowest in value?
8. What is the importance of oats as a stock food? Human food?
9. Explain the scarcity of references to oats in olden times.
10. Give the climatic characteristics of oats as a crop.
11. Explain their importance as a supplementary crop to other cereals.
12. Why do we not find rye being cultivated in the Mediterranean countries?
13. Discuss how the hardiness of rye makes it a popular crop under adverse conditions.
14. Show why rye is used in some sections of Europe as a human food. In our country as a stock food.
15. Where is rye grown chiefly?
16. Compare rye and wheat as bread makers. Barley and wheat.

PROBLEMS AND PROJECTS

1. Wheat is being harvested somewhere in the world during the entire year. Ascertain at what time during the year, and where, the smallest crop of wheat is being harvested.
2. Ascertain at what time during the year, and where, the largest crop of wheat is being harvested.
3. In what countries are primitive methods still used? Why there?
4. Why are the countries of western Europe large importers of wheat?
5. How can the wheat yield be increased in the United States?
6. Make a list of articles made from corn.
7. Make a list of breakfast foods and tell which cereal forms the base of each.
8. Prove that barley was well known to the ancients.
9. Prepare outline maps of the world showing the principal regions producing each cereal. Do the same with an outline map of the United States.

10. Collect pictures of machines used in cereal production.
11. Trace the journey of wheat from the wheat fields of Kansas through the flour mills to its final consumption in Boston. Tell the different modes of transportation used.
12. Make a list of the common trade classification of wheats and secure a sample of each if possible.
13. What are the present market prices of the different cereals in the nearest large market?
14. Make a list of our cereal exports. Our cereal imports.

TOPICS

1. The labor supply in the Middle West during harvest season.
2. The value of cereals as food.
3. Intensive cereal farming in Europe versus our methods.
4. Modern agricultural machinery for cereal farming.
5. The future food supply of the world.
6. How wheat is bought and sold in large quantities.
7. Corn and meat production in the United States.
8. The effect of the World War on the food supply of the world.
9. The future of wheat raising in the United States.
10. The prosperity of a country is gauged by what it eats.

FOR CLASS DISCUSSION

1. Eventually there will not be enough food for the rapidly increasing population of the world.
2. Rice will take second place to wheat as a world food.
3. Cereal farming in our West offers a good investment for surplus capital.
4. The government should regulate the price of wheat.
5. A diet composed principally of cereals is better than one in which meats predominate.

CHAPTER XII

BEVERAGES

SECTION 1—COFFEE

History of Coffee. It is difficult to find out exactly the true story of the discovery of coffee as a beverage. It is generally agreed that the coffee tree was a native of Abyssinia and was carried to Arabia about the thirteenth century. About that time, coffee became a popular drink among the Arabs and the Mohammedans. Its use and cultivation were spread by the pilgrims to Mecca and about the middle of the sixteenth century, coffee became a popular drink in Constantinople in spite of the edicts of the Mohammedan priests against it.

We find it appearing in France in 1669, being introduced to the court there by a Turkish ambassador. Shortly after, an Armenian opened up the first coffee house or café in Paris. Louis XIV encouraged its cultivation, and from the French plantations in Martinique have come the great coffee plantations of South America. An English merchant who had acquired a taste for coffee opened up the first coffee house in London in 1652. During the seventeenth and eighteenth centuries the London coffee houses acquired a great popularity and were the meeting places of many famous men. In this country the coffee houses were favorite gathering places for the patriots preceding and during the Revolutionary War.

The lead in coffee production was held at the start by Arabia, then by the West Indies, Java, and finally Brazil, whose great crop now overshadows in importance all other countries combined.

Growing Conditions. Coffee is essentially a tropical and sub-tropical commodity. Frost is deadly to it, yet, on the other hand, it cannot stand too much heat. Hillsides and low mountain sides, especially on the fringes of the temperate zone, are favored places because they furnish a cooler temperature and afford quick drainage for the necessary rainfall. From 75 inches to over 125 inches of rainfall, well distributed, are required annually.

In locations where high winds occur, windbreaks are necessary, and in some places, shade trees are required to keep off a too direct heat from the sun. The best soil appears to be a red volcanic earth which is rich and well drained. Brazil is highly favored in all these conditions, and in this one country alone there is much space which could be devoted to increased production. The world area suitable for coffee culture is greater than its needs, and the unsteadiness of the market is due to this fact. In times of high prices many new trees are planted, which factor later tends toward over-production, which, in turn, lowers the price.

Varieties of Coffee. Although there are many varieties of coffee, two stand out as leaders and furnish most of the coffee of commerce. The Arabian coffee plant or tree grows to a height of about sixteen feet, though in many cases it is kept pruned down to eight feet for ease of picking. It bears white flowers which soon drop off and are replaced by the coffee berries, which resemble cherries. These berries are green at first, changing to a red, and finally to a dark crimson when ripe. They are composed of a juicy pulp in which are embedded two seeds, flat on one side and rounded on the other, the flat sides facing each other. Around these is a fine silver skin which in turn is surrounded by a parchment like covering, covered by the juicy pulp. Sometimes the berry has but one seed, round in shape. This kind is called the pea berry and is considered more valuable.

The Liberian coffee tree originated on the west coast of Africa. It grows to a greater height, when allowed to, than does the Arabian tree. It is more hardy and drought-resisting, stands more heat, and is less subject to disease than the Arabian. Its berry, while larger, is of an inferior quality. Liberian coffee was introduced into Ceylon and the

West Indies at the time of the great coffee tree blight with the hope that it might save these districts. It still remains in Java. Most of the coffee in the Americas is Arabian.

There are several local varieties of coffee, each with their merits, but of little influence on the general market. Coffee was originally graded by its place of origin, and we find three classifications in the trade. Originally Mocha coffee came from Arabia through its seaport of Mocha; Java coffee came from the island of that name and its neighboring islands of the East Indies, and Rio came from Brazil. These names have become trade names, and trade usage oftentimes classifies coffee, not from its place of origin, but from its similarity to the kinds of coffee from those places.

(Keystone View Company, Inc., N.Y.)

FIG. 70. HARVESTING COFFEE

Countries of Production. The lead in coffee production was held, at the start, by Arabia, and then successively by the West Indies, Java, and finally by Brazil, which now alone produces about two-thirds of the entire world production. Over ninety per cent of the world's coffee is grown in the western hemisphere.

Beginning in Mexico, coffee plantations stretch southward through Central America to Venezuela, Colombia, and then on to Brazil. The immense coffee producing land of Brazil is located in four provinces, in the center of which is Sao Paulo and its port of Santos, with its long water front lined with boats waiting for coffee cargoes.

The coffee from the East Indies is of high grade and is in demand. Some coffee comes from Arabia although the most of the Arabian coffee is consumed near its source. Governmental control of coffee raising in Java maintains its high standard of excellence. India raises some coffee in the northern part near the Ghats Mountains.

Ceylon has turned its attention from coffee growing to tea culture, because of the disastrous scourge which visited its coffee trees a few years ago. Some coffee is grown in Africa which, although the home of the Liberian coffee tree, contributes but little to the world trade in coffee.

Coffee Cultivation. There are two methods of growing coffee plants. One way is to plant the seeds in well prepared ground where the tree is desired, two or three seeds being planted to insure one good plant. Later, the poorer plants are pulled up and the one best plant allowed to grow. The plants are spaced far enough apart so that when they are mature there is enough soil to nourish them well.

Another way is to grow the plants in a special nursery until they are large enough to transplant. In both cases great care is taken in weeding and in protecting the young plants from too much sun and too much wind.

Sometimes banana trees are grown between the rows of coffee trees to afford both shade and wind protection. Oftentimes more permanent trees are planted for this purpose. The amount of protection from wind and sun varies with different locations and conditions.

In about three to five years the coffee plant begins to bear and will continue to bear for many years thereafter. The time of fruiting of the tree varies, depending upon climatic and soil conditions. In Brazil, the coffee harvest season begins in April and lasts until October, the warmer regions bearing first. From the time of blossoming to fruiting, coffee takes about seven months. Because of economies in harvesting and preparing for market, planters prefer locations where the climate is such that the coffee berries ripen at approximately the same time.

Harvesting Coffee. In Arabia, the coffee berries are allowed to ripen and to fall without being picked.

In Brazil, the coffee pickers use care in stripping the berries from the tree so that the trees are not injured. The berries that fall on the ground are also gathered. Sometimes a cloth is placed around the tree to catch the berries that fall. This wholesale method of picking the trees results in a mixture of ripe, unripe, and over-ripe berries, together with leaves and twigs, which latter must be sorted out.

In Java, great care is used in picking, and only the ripe berries are gathered, which results in three distinct pickings. Java excels in picking coffee, while Brazil surpasses in the preparation of the berries for the market. Java has a large labor supply, while Brazil uses the best machinery in handling the berries after picking.

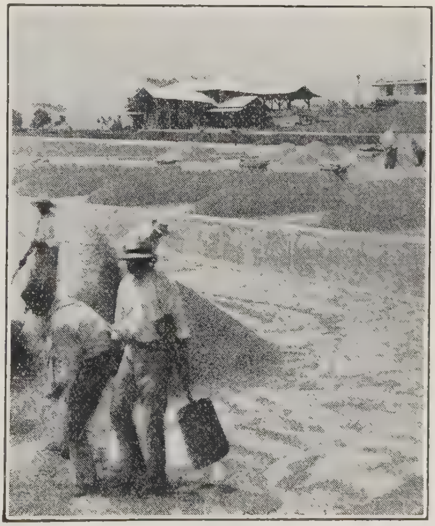
On the smaller plantations, coffee is placed in baskets and taken to the coffee mill, where it is prepared for shipment to market. On the larger plantations, flumes of running water often convey the berries down to the mill.

Preparation of Coffee for Market. Two methods are now in use to prepare the coffee for market. In the dry method, the berries are dried first and then the seeds are freed from the rest of the berry. The berries are dried by placing them in the sun. Local conditions determine the best way of doing this. Sometimes large stone or cement floors are built and the berries placed on them in the sun, a workman turning them over so that they dry on all sides.

Because of the possibility of showers, it is necessary, sometimes, to provide portable roofs to cover these floors.

Oftentimes the coffee berries are placed on large trays which can be carried under cover upon the approach of rain. These trays may be placed on wheels and trucks and pulled under a roof quickly when necessary. As yet, artificial drying has not been found practical.

When the berries are thoroughly dried, they are stored until the next process is desired. The dried berries are broken up by pounding in mortars, or by friction machinery, and the two little coffee seeds are freed from their coverings, the chaff being blown away by the wind or by a current of forced air.



(Keystone View Company, Inc., N. Y.)

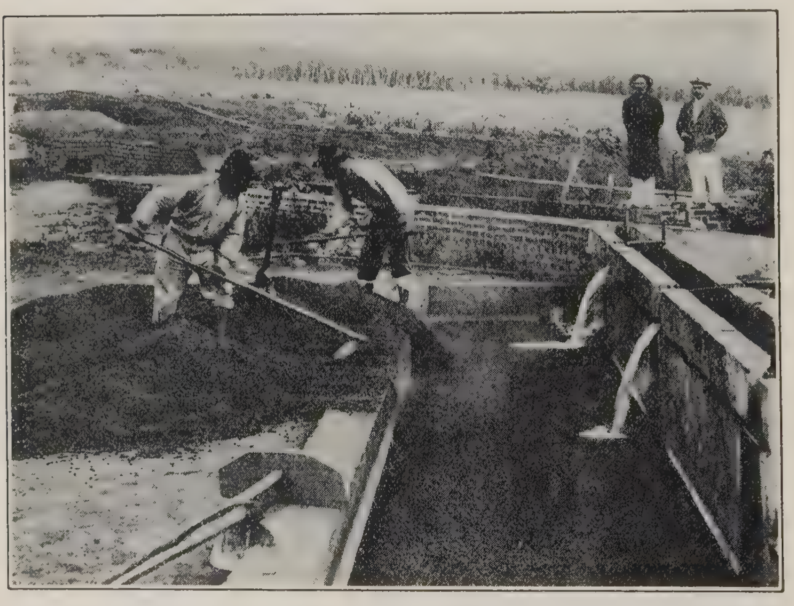
FIG. 71. DRYING COFFEE

The wet method differs from the dry method in that the pulp is rasped off the seeds before the drying process. The berries are placed in a large tank where the good berries sink and the unripe and overripe berries rise to the top of the water. These are drawn off and handled separately. The good berries pass through a machine which rasps off the soft part. The pulp and seeds are then separated by water, the pulp floating and the seeds sinking. The seeds are washed and allowed to soak for a few days to loosen the pulp that still sticks to them. A thorough washing and slight friction from rakes and shovels remove what little pulp may adhere.

The seeds, still in their skin and parchment coverings, are then dried by the sun. When they are completely dried, the silver skin and parchment are removed by friction machinery and winnowing. The seeds then are ready for market. They are the small green coffee beans we see in our stores.

The beans are roasted near the consumer, just before consumption, and are ground at the retail store in which they are sold in order to preserve the oils and aroma so much desired.

Countries of Consumption. Coffee is primarily a commercial product. Countries which lead in coffee consumption are not producers of it, and must depend on commerce to bring it to them. The United States is the largest consumer, requiring almost half the world's supply. Germany, Brazil, France, and the smaller European countries follow. The Dutch are the largest per capita coffee drinkers, averaging over twenty pounds of coffee per person a year. In the United States we use over twelve pounds per person a year. Germany, in normal times, uses over six pounds per person a year. The British are small coffee drinkers averaging less than a pound per person a year.



(Photograph from Wide World Photos)

FIG. 72. WASHING COFFEE

Adulterants. Many things are used to adulterate coffee, the most prominent being chicory, although many people do not consider chicory as an adulterant but rather as a blend. Roasted peas, cereals, sawdust, beans, baked liver, burnt parsnips, and bark are all used to adulterate coffee.

There are several substitutes for coffee which are offered to those who find coffee injurious. These substitutes are almost all made from cereals which are roasted and blended to approach the taste of coffee and yet lack its injurious qualities.

TEXT QUESTIONS

1. Who were probably the first coffee drinkers?
2. Explain the popularity of coffee houses in England. In America.
3. Name and describe the two principal coffee trees.
4. Give the principal trade names of coffee. Why are they so named?
5. Give the principal conditions of successful coffee growing.
6. Explain the rise and fall of coffee prices.
7. List the principal regions of coffee growing. Why these?
8. From where do we get most of our coffee?
9. Give the two ways in which coffee is planted.
10. How are coffee trees sheltered from wind and sun?
11. Why is it advantageous for coffee planters to have coffee ripen at the same time yearly?
12. Tell how coffee is harvested in the various regions.
13. Contrast harvesting in Java and Brazil.
14. Contrast the two methods of preparing coffee for export.
15. Why is the roasting and grinding of coffee delayed until just before its use?
16. Show how coffee enters into world commerce. What countries are the greatest consumers?
17. Give the ways in which coffee is adulterated.

SECTION 2—TEA

History of Tea. It is now generally agreed that the tea plant originated in the Province of Assam in India, from whence it found its way into China at an early period. The discovery of its use is credited to the Chinese. As early as 2700 B.C. a Chinese writer mentions it and we are told by a later Chinese writer in 400 B.C. that the brew made from its leaves has medicinal value. Probably it did not become popular as a beverage until about 500 A.D.

Its introduction into England dates from the last of the sixteenth century. As England became a leader in Oriental trade and the prices dropped, tea became more and more popular in England, until today the English people are the greatest tea drinkers of the white race.

During the last century, tea culture has been practised more in India and Ceylon, resulting in their leadership in cultivation and value of crop to the detriment of China.

Conditions of Growth. Tea is a subtropical plant, requiring steady warmth while growing, but hardy enough to withstand occasional frosts. For this reason we find it growing at some distance from the equator. The soil should be fairly rich, with a good humus, preferably rich in iron. The red soil, suitable for coffee, is also very suitable for tea. Plenty of rain is required and for this reason the monsoon district of southern Asia is the ideal district for growing tea.

Tea is generally planted on hillsides because this land provides good drainage and also is less desirable for other crops necessary to sustain the large populations found in tea growing districts. The picking of the leaves requires hand labor with a certain skill and, for this reason, the tea industry is located in the Orient where there is an abundance of such labor.

While perhaps tea culture could be carried on in the United States throughout the cotton belt, the absence of cheap skilled labor makes it unprofitable in competition with the cheaper labor of the Orient.

Varieties of Tea. In commerce, two great classifications of tea are found, black tea and green tea. For some time it was believed that each kind was borne on a different species of tree, but it is now known that the method of preparing the tea for market determines its color, both black and green tea being made from the same leaves.

The various trade names of tea depend upon three factors: the way the tea is cured, the grade of leaves used, and the region from whence the leaves come. In general, black tea is caused by a fermentation of the leaf, and among the black teas we find Flowery Pekoe, Orange Pekoe, Suchong, Oolong, Pekoe, Congou, and Bohio. Green tea is not allowed to ferment but is dried quickly. Under green tea we have Gunpowder, Imperial, Hyson, Young Hyson, and Hyson Skin. Tea regions which give trade names to their product are China, Japan, Ceylon, and Formosa.

The most desired tea leaves are the young, tender leaves and buds of the first picking. Very little of this kind of tea reaches the world markets, most of it being saved by the growers for their own use or for presents. A great variety of tastes demands various kinds and grades of tea; for this reason there is a wide choice made possible by the producers.

Countries of Production. Tea naturally brings to our mind China. China probably produces more tea than any other region in the world, although India far surpasses China in the value of its tea exports. The crop of China, while large, is inferior in quality. The better quality of tea from India brings a much better price.

If the value of crops is taken as a measure, the countries of world production follow in this order: India, China, Ceylon, Japan, and Formosa. Some tea is raised in Natal and some also in Transcaucasia, but these regions do not enter into world commerce at all, their crops being consumed locally and importations still being necessary. It is only within the past century that tea culture in India and Ceylon has come to the front. After various experiments, the English found that tea thrived in the northern part of

India, especially in Assam. This led to a rapid expansion of tea culture until India now leads the world.

The coffee blight in Ceylon turned the minds of planters towards tea culture with the result that tea has taken the place formerly held by coffee, and is now the chief industry of the island. Both India and Ceylon are favored in that picking can continue practically the whole year long, at short intervals.

Tea culture in China is extensive, but due to antiquated and somewhat unsanitary methods of preparation for market, China has lost much of its export trade to India, where machinery and modern sanitary methods prevail.

Japan specializes more in the green teas and finds her principal market in America. The tea of Formosa is famous for its quality, but is of comparatively small quantity.

Tea Cultivation. Tea is grown from seeds which form on bushes that are allowed to grow freely without pruning. These seeds are sprouted and planted in nurseries from whence the young plants, when about a foot high, are transplanted to the tea orchard in rows four feet apart each way. The plant would grow to from sixteen to twenty feet high if left alone, but because of greater strength in the leaves and ease of picking, the plants are kept pruned down to a height of from three to six feet.

The tea plant, or bush, is first ready to be picked when about three years old. In some regions this plucking of the leaves can be continued the whole year round, while in other regions but three or four pickings a year are possible. These differences are due in large part to variations in climate and rain supply. For the planting, pruning, picking, and weeding, a large, cheap labor supply is necessary.

In some regions in Japan the tea plants are shaded and produce a larger leaf. In general, however, little protection from the sun and wind is required in the tea districts.

Tea Picking. In China, the tea leaves are first picked about April. The little bud leaves are carefully taken off with skilled fingers and this crop is considered the finest tea of all. Little of it gets to market. The second picking occurs soon after and only the small tender leaves are sought. There is manual skill in picking tea leaves so as not to injure the tree. Then follows a third and fourth picking, the quality of the tea getting worse with each picking. The successive pickings must not be spaced too near together as this would injure the tree too much. It must have time to recover its strength before it is again picked.

In Ceylon, we find the opposite is true. Here the leaves are picked about every two weeks throughout the year, the quality improving as the season advances.

After about two years the tree is pruned severely and left to recuperate. The pickers are generally girls and women. The leaves as picked are thrown into large wicker baskets, and later the labor is paid by the weight of the leaves picked.

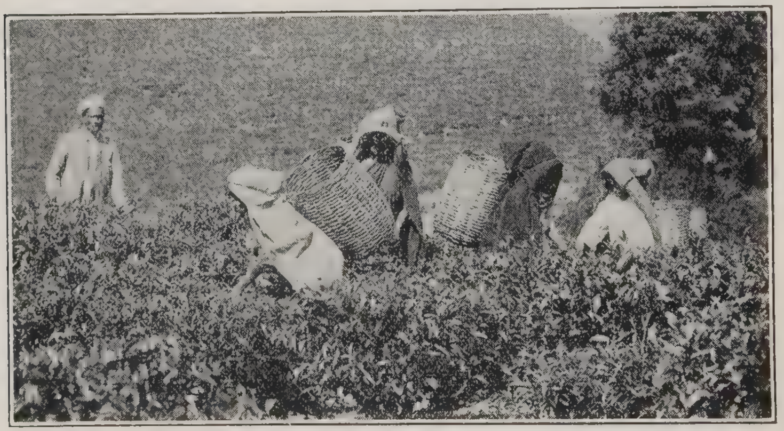
Preparation for Market. In China, primitive methods are still followed in preparing tea leaves for market. The process is carried on almost wholly by hand, resulting in a growing prejudice against China tea because of sanitary reasons. The leaves are first withered by being placed over a heated pan and constantly stirred. This results in the leaves becoming limp and damp from the juice that oozes from them.

The leaves are then taken to bamboo tables where they are kneaded into small tea balls, which liberates the juices and moisture in the leaves. This is called rolling the leaves. The next process is to gradually dry the leaves in such a way that they will retain their juices and yet lose their excess moisture. At this point the method divides. If green tea is desired, the rolled leaves are placed in firing pans of iron and dried by heat. An attendant constantly stirs the leaves to prevent them from burning and drying too rapidly. This quick drying results in green tea.

If black tea is desired, fermentation is allowed to take place before the leaves are dried. This is done by placing the rolled leaves in trays and placing them in the sun where a slow fermentation takes place. When this has reached the proper place, the leaves are dried in pans the same as green tea. This completely dries the tea and also stops the fermentation process.

A process similar to the above may be observed in making hay. Grass that is dried quickly in a hot sun has a green color, while grass that is dried slowly becomes black in color.

Throughout the whole process of preparation for market, the tea leaves are handled with human hands. The final operation consists in packing in cases or chests, as they are called, bare feet being used to tramp the leaves down. The tea chests then go down to the ports where they are packed and graded for export.



(Photograph by Ewing Galloway, N. Y.)

FIG. 73. PLUCKING TEA

Frequently artificial dyes of non-poisonous type are used to color teas a bright green or a real black, and so increase their selling qualities. This kind of tea is called "lie tea" by the Chinese and is never used by them.

Another way of preparing tea for market in China is in the form of brick tea. After the tea is cured it is ground up, mixed with rice paste, and pressed into molds, where it is allowed to harden for about three weeks. When taken from the mold these bricks are hard, and are taken to Thibet and Mongolia, where this form of tea makes transportation easier. Ofttimes this tea is of very poor grade, and not much care is used in its preparation, the twigs and stems all being ground up together with the leaves. Another way of preparing tea is for the Russian market. Small tablets are pressed from powdered tea of good quality.

In India and Ceylon modern methods and machinery are employed in preparing the leaves for market. The leaves are withered in iron trays, rolled in special machines, and dried or fired in other machines which time the drying correctly. In this way the tea leaves are not touched by human hands after picking.

Japan uses the hand methods in preparing its own tea but uses machinery in preparing the tea for export.

All tea for export is packed in air tight packages generally lined with lead. This prevents moisture from spoiling the dried leaves and keeps the desired aroma and qualities from loss. In this country the tea is repacked into sealed packages for the retail trade.

Countries of Tea Consumption. The amount of tea which is consumed in China and Japan can not be estimated. It is the everyday drink in these countries and forms the principal beverage of the Orient. Among the white races, the English lead in tea consumption. The Australians average seven pounds per person a year. The English use about six pounds per person yearly. The Canadians average four pounds annually.

The amount per capita is low in the United States, about a pound per year, but the total consumption is large. In total consumption England leads the world, taking almost half the entire world crop annually. The Russians, contrary to popular belief, are not great tea drinkers, only the more wealthy being able to afford it.

Adulterants. Many leaves of other trees are mixed with tea leaves as adulterants. Leaves from rose, ash, plum, buckthorn, and many other plants are used. Sometimes tea is scented by flowers from various plants. Mineral adulterants are used to make the tea weigh more and also to give it a better appearance.

Other Teas. The most important product of South America is mate, or Paraguayan Tea, which comes from a shrub growing there. It is a member of the holly family, with leaves about four inches long. The leaves are roasted on the limbs and then reduced to a powder. This powder, mixed with hot water, gives a refreshing and invigorating drink. Another form of tea is found in our South and was used by the Indians. It is called youpon. Other types of tea are made from various leaves and grasses. Mate is the only one that has commercial importance.

TEXT QUESTIONS

1. Contrast black and green teas in method of preparation.
2. What are the principal green teas? Black teas?
3. Discuss the history of tea as a beverage.
4. What conditions are necessary for tea culture? Name some places where these are found.
5. Explain the influence of cheap labor on tea growing in the Orient. In the United States.
6. Name the leading countries of production in order of amounts of tea grown.
7. Name the leading tea growing countries in the order of the value of tea grown.
8. Describe tea growing in India and Ceylon. Why is this tea preferred to that of China?
9. Describe how the tea is cultivated.
10. How is tea picked in the different countries? Explain.
11. Describe how tea is prepared for market in China, in India, and in Ceylon.
12. What kind of tea does Japan specialize in? Where is her best market?
13. What peoples lead in tea drinking?
14. How is tea adulterated?
15. What is brick tea? Why is it packed this way?
16. Name some of the unusual kinds of tea beverages. Which one has some commercial importance?
17. Name the various ways in which tea is packed for market.

SECTION 3—CACAO

History of Cacao. There are three trees from which we get commercial products with names so nearly alike that we are often confused. From the coconut tree we get coconuts, from the coca tree we get cocaine, and from the cacao tree we get cocoa and chocolate.

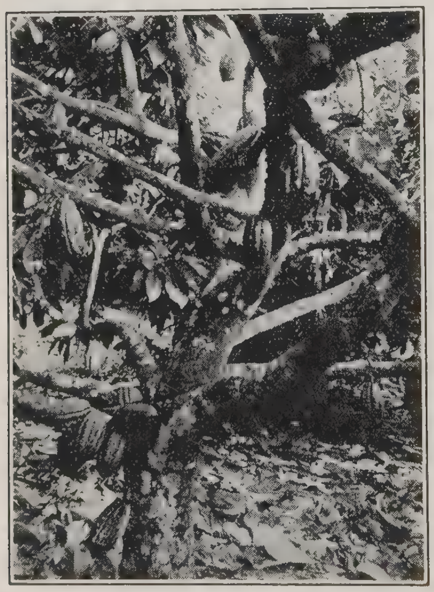
When the Spaniards landed on this continent they found the natives drinking chocolate, which was a drink new to the explorers. How far back into history chocolate drinking goes we are unable to find out exactly, but we do know that the Incas and the Aztecs drank it a long time ago. Records show us that frequently the cacao beans passed as money, and even to this day, in some parts of Central America, cacao beans are a medium of exchange.

The Spanish carried the use of the drink to Spain and for many years controlled its trade. The custom spread all over Europe and America and today there is an enormous demand for the products of the cacao bean: cocoa and chocolate.

Conditions of Growth. The cacao tree demands certain very definite conditions. It requires much heat, but cannot stand too much direct sun, which necessitates shade, either natural or artificial. It requires much rain. The soil must be deep and rich. As wind is fatal to its production, it must be grown in regions protected, either naturally or artificially, from the wind. For this reason many of the West Indies are unable to grow it, being exposed at times to high winds. It is generally known on tropical lowlands where the heat and moisture conditions are right. As these regions are unhealthy it is difficult to secure an adequate labor supply.

The sections around the Caribbean Sea, the Gulf of Guinea, and the Amazon Valley are the most favored regions of growth. The limits of the equatorial calms (thirteen degrees each way from the equator) appear to mark the boundaries of successful cacao culture.

The tree, which is an evergreen, normally grows to about twenty feet in height. The blossoms and fruit grow directly on the trunk and larger limbs of the tree. The fruit resembles a cucumber in shape but is much larger in dimensions. It contains from thirty to forty big seeds, resembling almonds but larger.



(Keystone View Company, Inc., N. Y.)
FIG. 74. CACAO TREE
Cacao pods grow from the trunk and limbs of the tree.

A Cacao Plantation. Cacao trees are raised from seed, either in nurseries or in orchards. When they are planted directly in their permanent locations, they are spaced far enough apart to allow for the spread of the mature tree, about fifteen to twenty feet apart. Generally two or three seeds are planted in one place and the inferior plants are pulled up, allowing the best plants to grow.

The more common method is to raise the young plants in a special nursery where better care can be given them. When about a foot high, the young trees are transplanted to the orchard. Great care is taken to protect them from too much sun and wind. Shade trees are planted between rows. Sometimes banana trees furnish both shade and wind protection.

In about five years the trees begin to bear fruit. From blossom to fruiting time takes around four months, and the blossoming and fruiting continue all through the year, although the principal crop is gathered in the early part of the dry season. Some fruit can be picked by hand from the ground, that higher up being cut by a special knife on a pole and the fruit caught as it falls. Great care must be used not to spoil the blossoms which mean fruit later on.

The pods or fruit are carried to a spot where they are cut open and the seeds taken out. To remove the slimy covering of the seeds, they are piled in heaps and allowed to ferment. Great care must be used not to leave them too long. Three days are usually enough to complete this process. The beans or seeds are then washed, or rubbed, to get off any pulp that may still cling to them. They are then dried as the coffee beans are, on stone floors or sliding trays.

After they have been dried, sometimes red clay is mixed with the beans to add a reddish color. The beans are then polished either by machinery or by spreading them out into heaps and rubbing them against each other. It is quite a common sight to see barefooted laborers shuffling along through these heaps. This is called the "cacao dance." When machinery is used, the beans are moved around and rubbed by mechanical friction.

After polishing, the beans are ready for market and are shipped to Hamburg, Havre, London, and New York for further handling and preparation.

At the Chocolate Factory. The beans, when unloaded, are thoroughly cleaned from impurities by washing, by strong blasts of air, and by sifting. In sifting, the beans are separated into three sizes. They are then roasted in huge cylinders. This gives them the desired flavor and also makes the hulls or shells more brittle. They are then crushed so as to remove the shell, or hull, from the outside of the bean, leaving the inside, which is called nibs. These shells are afterwards used in various ways, as cattle food, fertilizer, and other by-products. The nibs are ground into very fine particles.

At the last of the grinding process, the mass becomes liquid owing to the presence of cocoa fat and oils plus the heat. The fat is pressed out of the ground nibs by hydraulic presses and is known to trade as cocoa butter. It is very desirable in the making of salves and medicinal preparations, and forms the base of many facial creams. It has the virtue of not becoming rancid with age.

From the remaining powder we get cocoa. Sugar, milk, spices, vanilla, and other flavoring extracts are combined with the ground up nibs to make chocolate and candy. Cocoa and chocolate, in addition to having a stimulating effect, have a high food value.

The Geography of Cacao. Although a native of the Americas, the cacao tree has been transplanted to the Old World with success. The leading countries of production in this hemisphere border the Caribbean Sea. Ecuador is the most important, followed by Brazil. Some cacao is raised on the protected West Indies, in Venezuela, in Mexico, and in the countries of Central America. Cacao has found a favorable habitat around the Gulf of Guinea in Africa, and is rapidly extending its acreage in Ceylon and the East Indies. For a long time Spain led in the consumption of cacao and its products, especially chocolate, but Germany, France, and Holland have surpassed her.

The United States makes an enormous demand for chocolate both as a beverage and for candy. It is the most popular soda fountain flavoring and this use alone requires many hundred thousands of pounds of cacao beans.

TEXT QUESTIONS

1. Tell the difference between the coconut tree, the coca tree, and the cacao tree. What products do we get from each?
2. Describe the discovery of chocolate as a drink.
3. Discuss the growing conditions of cacao. Why is it hard to get labor supply for its cultivation?
4. Where is the cacao tree grown principally?
5. Describe the characteristics of a cacao tree. Cacao pod.
6. Tell how cacao trees are planted and cultivated.
7. How is cacao harvested?
8. How are the cacao beans prepared for export?
9. Describe the processes through which the beans go to prepare them for the market in the form of cocoa and chocolate.

10. What is cocoa butter and what is it used for?
11. Discuss the geography of cacao production and consumption.

PROBLEMS AND PROJECTS

1. On an outline map of the world show regions of production and consumption of tea. Coffee. Cacao.
2. What is the chief reason for the non-development of tea culture in the United States? Coffee? Cacao?
3. Explain the large per capita consumption of tea by the English.
4. Explain the popularity of tea in the Orient.
5. Explain why coffee is popular among Mohammedans.
6. Contrast the coffee consumed in Europe and America in quantity and quality.
7. Explain the popularity of chocolate.
8. Why is chocolate a good emergency ration?
9. Collect samples of different teas. Compare them.
10. Collect samples of different coffees. Compare them.
11. Collect pictures showing the culture and manufacture of the beverages.
12. Why does cocoa retain heat longer than tea?
13. Make a list of coffee substitutes.
14. What is the harmful thing in coffee? In tea?

TOPICS

1. The old English coffee houses.
2. Discuss the food values of tea, coffee, and chocolate.
3. Races and beverages.
4. The Boston Tea Party.

FOR CLASS DISCUSSION

1. Coffee is more beneficial than tea to the human race.
2. The human race would be better off without coffee or tea.

CHAPTER XIII

SUGARS

SECTION 1—CANE-SUGAR

History of Sugar. Sugar, from sugar-cane, originated probably in southern Asia, from whence it was carried to Egypt and later to northern Africa. The Bible makes no mention of it, which indicates its absence in ancient times. Alexander mentions it in the record of his march into India. The ancient Greeks knew of it only as a rare thing and called it Indian salt. Honey formed the only real common sweet in early times.

At the time of the Crusades, sugar was evidently known somewhat in Asia Minor, as some of the Crusaders brought back a taste and a desire for it. This led to the growing of the cane in the Madeiras and Canary Islands. Upon the discovery of the West Indies, cane-growing received a great impetus and the supply of available sugar increased rapidly, to the great enrichment of the Spanish peoples.

With increased production came a corresponding lowering of price, until today the sugar habit has become well fastened upon all progressive and prosperous peoples.

In this country, sugar was so rare in Colonial days that it was customary to lock the sugar bowl which stood on the tables of the wealthy, to prevent theft by servants. From 1860 on, the use of sugar has increased at a rapid rate; our per capita consumption has grown four fold, until we each consume between two and three pounds weekly and well over one hundred pounds yearly. It is interesting to note that since prohibition our use of sugar has risen about thirty pounds per capita yearly.

This greatly increased consumption of sugar all over the civilized world is one of the most remarkable facts of the last century. What effects this increased use of sugar will have on the human race eventually is a question to be yet decided. One thing is sure, it has passed from the luxury class to the necessity class.

Beet-sugar culture began during the Napoleonic Wars in Europe when France, blockaded from her cane-sugar supply, turned to beets for sugar. Napoleon offered prizes for a practical method of extracting sugar from beets, with the result that beets were so improved as to be made practical for this purpose. Under government subsidies beet culture spread rapidly. Meanwhile science improved the beets so that now we get a pound of sugar from about seven pounds of beets, rather than from twenty pounds of beets as at the beginning of the industry.

All over northern Europe the sugar-beet industry is well established, and in this country, it is one of the principal sources of our sugar supply. Beet-sugar supplies about one-third of the world production of sugar.

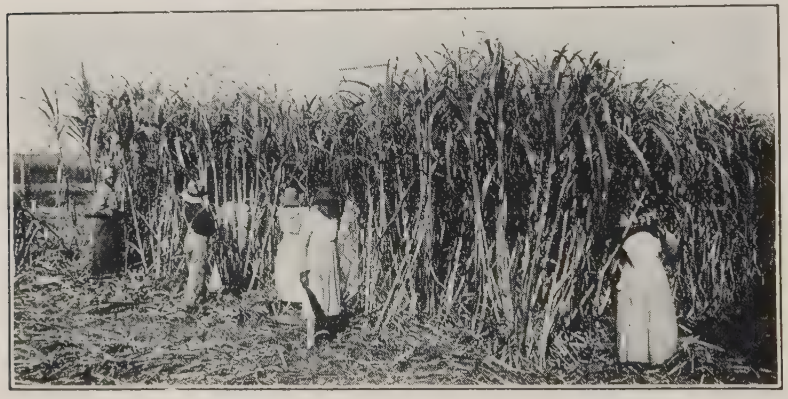
Sources of Sugar. Almost all plants store up some sugar for future use. Some store it in the form of starch, but others keep it as sugar. Among the plants, two stand out as particularly rich in sugar, the sugar-cane and the sugar-beet, and these two form the source of our commercial sugar.

In the northeastern part of the United States maple-sugar is extracted from the sap of the maple tree, and is a much prized delicacy. The palm tree furnishes a palm-sugar. Milk-sugar is secured from milk. The corn plant also furnishes us with a sugar, principally in the form of syrups for cooking. Grape-sugar is much prized in medicinal mixtures.

Nature supplies us through our vegetables and fruits with all the sugar we need in the human system but we crave more sweetness and so we demand sugar in excess for our palate. Sugar is a carbohydrate and supplies fuel for our bodies. If overeaten, it has a tendency to make one fat.

Requirements of Sugar-Cane. Sugar-cane is a tropical and subtropical plant. In appearance it resembles a cornstalk with the ribs of a bamboo but with a solid fibrous center. In some cases it grows as high as twenty feet, although usually it rises only six or eight feet. Sometimes it has a flower somewhat resembling a corn tassle. The stalk is full of juice which, when boiled, yields the desired sugar.

Sugar-cane grows best in regions where the temperature is above 75 degrees, although it will grow in regions where the temperature drops below this, providing it has an eight-months growing season free from frost. It is a lover of sun, and plenty of sunshine is necessary to secure cane with a large per cent of sugar. Frequent, abundant showers are required unless irrigation supplies the necessary water.



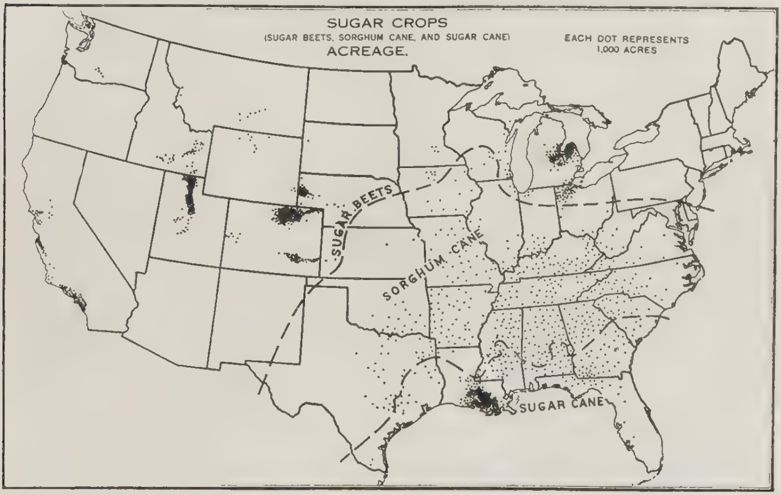
(Courtesy U. S. Department of Agriculture)

FIG. 75. SUGAR CANE

Sunny, irrigated regions make an ideal setting for a sugar cane plantation. The soil should be rich in phosphates and preferably level, with proper drainage. Only extremely high winds are injurious to cane.

The Geography of Sugar-Cane. Countries having the above conditions naturally are the preferred locations for raising sugar-cane. The Commerce Yearbook for 1926 lists the countries leading in the world production of cane-sugar as follows: Cuba, British India, Java, and Hawaii.

Cuba stands out as a leader in world production, furnishing about one-third of the entire world supply. Most Cuban sugar is sold in the United States. British India, supplying about one-quarter of the world production, comes next. Most of her crop is consumed locally, the remainder being exported to England. Java ranks third, exporting the greater share of her crop. Most of the West Indies, led by Porto Rico, grow sugar cane, exporting any surplus after local demands are met. Hawaii and the Philippine Islands raise large crops mostly for the market of the United States. Brazil ranks well up in the list of producers. Australia produces some sugar-cane, most of which is used locally in the making of jams.


SUGAR CROPS
(SUGAR BEETS, SORGHUM CANE, AND SUGAR CANE)
ACREAGE.
EACH DOT REPRESENTS 1,000 ACRES
SUGAR BEETS
SORGHUM CANE
SUGAR CANE

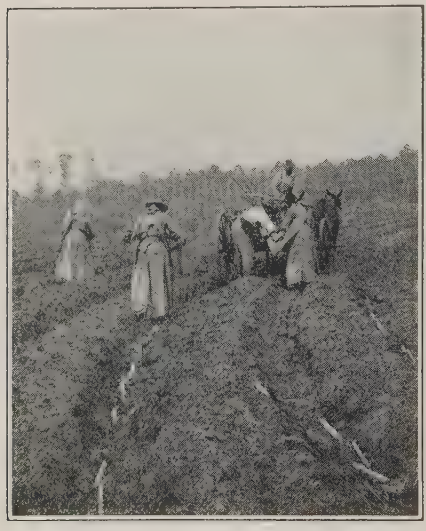
(Courtesy U. S. Department of Agriculture)

FIG. 76. ACREAGE OF SUGAR CROPS

The great consumers of the world are the most prosperous countries. The United States takes almost one-half of the world supply, while England uses much per capita. Europe is supplied chiefly from the sugar-beet culture near at hand.

A Sugar-Cane Plantation. We shall not describe here the primitive methods of raising sugar-cane and its subsequent refinement, but shall confine ourselves to a description of the modern methods employed on the large sugar-cane plantations in Cuba, which will illustrate the general way of growing and making sugar.

Cane is grown from small pieces of sugar-cane called ratoons, from which sprout the future canes. The field is prepared in long deep furrows about four feet apart. The ratoons are laid horizontally, end to end, in the furrow. In some places they are planted vertically. In a few days the sprouts come through the surface of the earth. Weeding is necessary until the cane is up enough to shade the growth of weeds.



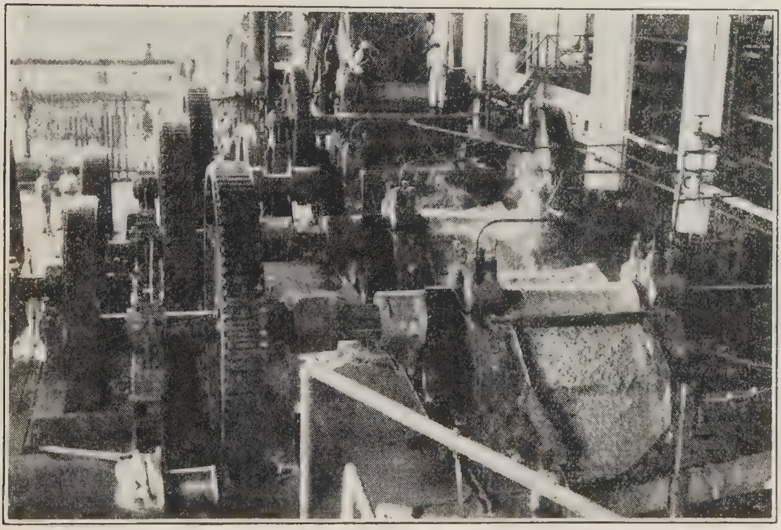
(*Courtesy U. S. Department of Agriculture*)
FIG. 77. PLANTING SUGAR CANE

In Hawaii, paper is spread between the rows. This prevents the weeds from coming up but does not hold back the cane, which pierces it with its sharp pointed sprout. In some places weeding is done by machinery, in others with hoes.

After about seven or eight months, the cane has grown, is matured and ready for cutting. The cane cutters, with long knives called machetes, sweep across the field in a long line, each man trying to keep up with his neighbor. The cane is cut near the ground, stripped of its leaves, and left for cheaper labor to gather into bundles.

The cane is then gathered by bull carts or little trains on portable tracks and carried to the sugar mill. Here it is weighed and samples taken of its juice as it passes through the cane crushers. Later, the value of the cane as a sugar producer is determined by chemists, who analyse the juice for its sugar content and thus find out what a given weight of the cane will produce in real sugar.

From the unloading platform, the cane moves along on an endless belt up to the big rollers which crush it thoroughly. Sometimes the cane passes through three of these big roller crushers so that every possible drop of juice is squeezed out of it. The fiber that is left is called negass and furnishes fuel for the fires. Recent processes now make it into a wallboard for builders.



(Keystone View Company, Inc., N. Y.)

FIG. 78. A SUGAR MILL

The juice runs down into large vats, where it is purified by adding a milk of lime and skimming off the impurities that rise to the surface. It is then boiled in boilers called vacuum pans. Liquids boil at a lower temperature in a vacuum. This saves fuel and conserves some of the sugar crystals.

When the juice has boiled down to a certain degree, which the skilled operative knows by testing it for crystallization, it passes through pipes to a machine called the centrifugal. This resembles a large tub with a wire screen inside it. The centrifugal is set in motion and the mass inside is thrown against the inside screen. The liquid passes out through the holes while the sugar crystals are retained inside being unable to get through. This sugar is called raw sugar and is the brown sugar we find at the stores. The liquid which passes through the holes is later refined for molasses and cattle food or distilled into alcohol.

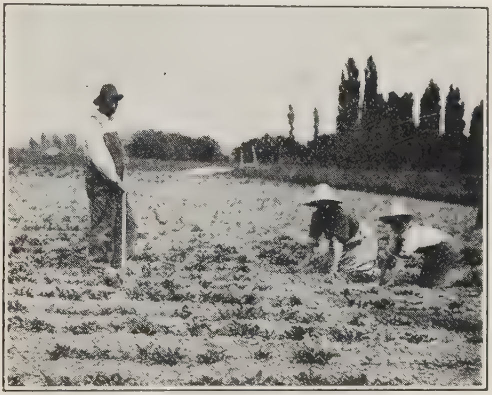
The raw sugar is packed in bags and shipped to the sugar refineries, which are generally located at large seaports. Here the sugar is melted down, bleached by sulphuric acid which is again counteracted by lime, strained through a charcoal filter, and run into centrifugal machines which separate the liquids from the sugar which is now the pure white sugar of commerce. This is pressed into molds for lump sugar, ground up for confectionery sugar, or left as granulated sugar.

TEXT QUESTIONS

1. Where did sugar originate? Was it common in ancient times? Explain. What was a common sweet then?
2. What historical events greatly expanded the growing of sugar cane? Explain.
3. Explain how cheapened production has increased the consumption of sugar since 1860.
4. What wars stimulated the cultivation of sugar beets in Europe? Explain the circumstances.
5. Give the principal plant sources of sugar. Which are the most important ones?
6. What countries lead in sugar cane production? In sugar consumption? Discuss.
7. What are the growing conditions of sugar cane?
8. Describe in detail the way sugar cane is planted and cultivated on a modern sugar cane plantation.
9. Tell how sugar cane is harvested and the juice extracted from the cane.
10. How is the juice reduced to sugar? Describe the processes in their order.
11. How is brown sugar reduced to white sugar? Describe.
12. Make a list of the by-products of cane sugar.
13. Where are cane sugar refineries located? Why?

SECTION 2—BEET-SUGAR

Sugar-Beet Culture. Beet-sugar is a product of the temperate zone. Ideal conditions call for a moderate spring, followed by a warm summer with plenty of rains, and a cool dry autumn. Fertile, mellow soil, rich in lime, is the best kind of soil. An abundance of cheap labor is required. In the crowded labor conditions in Europe this is at hand, but in this country the lack of it has been a serious handicap. Before money can be invested in a beet-sugar mill a steady supply of beets must be assured. Contracts between the mills and farmers insure a supply. The necessary, cheap, hand labor situation is taken care of by contract between the farmers and immigrant families who agree to care for a certain acreage and do all the work necessary in raising the crop.



(Courtesy U. S. Department of Agriculture)

FIG. 79. THINNING SUGAR BEETS

The seeds are planted in long rows in the early spring. When the little beet plants appear a careful thinning of them is required. This must be done on the hands and knees. No machine can do it. Later the ground must be continually weeded. This work is also done by hand, although on some larger farms horse weeders are used between the rows. When fall comes the beets are ready to be harvested. This is generally done by plows which throw the beets to one side. The tops are cut off and the beets piled up and covered with straw until time comes to take them to the mill, sometime during the fall or winter.

At the sugar mill, the beets are piled into large heaps, under cover. After being thoroughly washed, to get off the dirt and mud, they are sliced up into small slices by machinery. They are then placed in a series of large tanks through which warm water slowly runs.

The beet juice is washed from the pulp and comes out through pipes into a large tank where it is treated exactly the same as the juice of the sugar-cane. It should be noted here that beet juice is extracted by diffusion, while cane-sugar juice is extracted by pressure.

The tops and leaves are used as a cattle food. The pulp that remains in the diffusion tanks is pressed into cakes and also used as a cattle food. There is no waste in beet sugar making.

The refineries for cane-sugar are located on the coast where approach from the sea is easy. The refineries for beet-sugar are generally located at the beet-sugar mill.

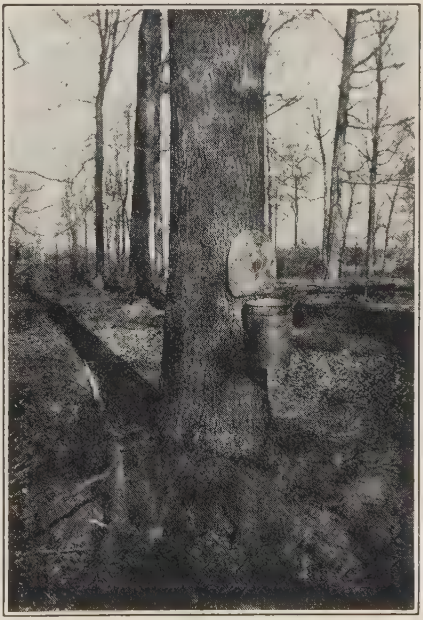
(Courtesy U. S. Department of Agriculture)

FIG. 80. BEETS READY FOR THE FACTORY

The Geography of Beet-Sugar. Across the northern plain in Europe, beet culture is an important industry. Germany leads all others normally and exports much. Belgium, France, and Spain raise sugar-beets. The southern parts of Sweden, Norway, and Denmark are beginning to enter into beet culture. In the United States the irrigated lands of the West afford ideal conditions, with their sunshine and their irrigation. Colorado leads, Michigan following. The northern and western edge of the corn belt finds beet culture profitable.

Beet-sugar is consumed almost wholly in, or near, the country of its origin. Before the World War, beet-sugar reached an equality of production with cane-sugar. The war was fought in one of the beet-sugar regions, and the world was thrown back on cane-sugar which rapidly gained the lead and now holds it. The 1926 Commerce Yearbook gives the world production of cane-sugar as twice that of beet-sugar.

Maple-Sugar. In the northern part of New England, New York and the southern part of eastern Canada, sugar is made from the sap of the maple tree, which is considered a great delicacy. The production of this sugar forms quite an important local industry although it does not enter into world commerce to any extent. The sap is taken from the trees through holes bored into the bark. It is boiled down, crystallized and molded. It is also sold as a maple syrup and is particularly sought after as a sauce and a confection.



(Courtesy U. S. Department of Agriculture)

FIG. 81. SECURING SAP FROM A MAPLE TREE

Palm-sugar, grape-sugar, and milk-sugar are used but little in the total world commerce and are particularly sought for only in medicinal preparations. Corn syrup is used as a sweetening syrup in cooking and sometimes on the table.

TEXT QUESTIONS

1. Name the factors that enter into successful sugar-beet growing. Explain.
2. Why is a supply of cheap labor necessary for the cultivation of sugar beets? Explain.
3. How is this cheap labor secured in Europe? In the United States? Explain.

4. Describe the way in which beets are planted, cultivated, and harvested.
5. Describe the method of extracting the juice from the sugar beets.
6. How does the method of extracting the juice from sugar beets differ from that of extracting the juice from sugar cane? Explain.
7. Contrast the location of cane sugar refineries and beet sugar refineries. Why is this?
8. What by-products do we get from sugar beets? What are they used for?
9. Discuss the geography of beet-sugar production.
10. Contrast beet- and cane-sugar in amount now produced.
11. What is maple-sugar? How obtained? What is its importance?
12. Name some other kinds of sugar.

PROBLEMS AND PROJECTS

1. Make an outline map of the world showing sugar-cane production.
2. Make an outline map of the world showing beet-sugar production.
3. On an outline map of the United States indicate the sugar-cane states and the sugar-beet states. Also locate the centers where sugar refineries are. Show the maple-sugar states.
4. Show how the discovery of America greatly stimulated the supply of sugar.
5. Secure samples of brown sugar, beet-sugar, and cane-sugar. Compare these and describe the differences.
6. What is glucose and what is it used for chiefly?
7. Make a list of the different kinds of sugars obtained from plants.
8. Construct a transportation map showing the routes used for sugar transportation and indicate the terminal cities.
9. How does the canning industry affect the price of sugar? Why?

10. What effect on the sugar supply did the World War have?
11. The United States has good land and a good climate for sugar production. Why do we import so much?
12. Discuss the use of the by-products of sugar cane.
13. Why is the chemist in a sugar mill so important and why must his integrity be above suspicion?

TOPICS

1. The passing of sugar from the luxury class into the necessity class.
2. The effect of national prohibition on the demand for sugar.
3. Sugar as food.
4. The history of sugar production.
5. The chemistry of sugar.
6. Sugar and the tariff.
7. Sugar as an article of international commerce.
8. The necessity or close co-operation between beet-sugar growers and the sugar mills.

FOR CLASS DISCUSSION

1. The government should admit into this country tax free those products which can be produced elsewhere more cheaply than at home.
2. The government is justified in encouraging home production by offering bounties to beet growers if necessary to meet the competition of sugar-cane growers.
3. The tariff on sugar should be abolished.
4. Beet-sugar will eventually win in competition with cane-sugar.
5. The government should regulate the price of sugar.
6. The production of sugar on the whole has been more detrimental than beneficial to the white race.
7. The use of glucose in candy making should be prohibited.
8. Beet-sugar refineries offer a good investment in our country.

CHAPTER XIV

PLANT PRODUCTS

SECTION 1—TOBACCO

Importance of Tobacco. The area planted to tobacco in the United States has trebled since the Civil War, until now tobacco ranks seventh in value among the farm crops. As an export, it ranks second, being outranked by cotton only if flour and wheat are estimated separately. As a source of federal internal revenue it ranks second only to the income tax. The tax on tobacco has risen from an equivalent of a little less than one dollar per capita in 1913 to almost three dollars and twenty cents in 1927, resulting in a gain in revenue income of almost 400%.

History of Tobacco. The smoking of bhang and hemp was practised by the Turks and other eastern people long before the discovery of America. The sailors of Columbus found the natives of the New World smoking a new substance which they called tobacco from the name of the Y-shaped pipe used. This new plant was carried to Spain where its culture was encouraged for its medicinal properties.

A man by the name of Nicot introduced it into France and from his name we get the name of nicotine which is the active poison in tobacco. The use of tobacco rapidly spread during the seventeenth century all over Europe in spite of the opposition of the clergy and ruling powers.

Virginia and Maryland found it a great source of income during their early colonial days and exported it heavily to the markets of Europe.

The Geography of Tobacco. About one-third of the world's production of tobacco is grown in our own country. Other countries of importance are British India, China, the East

Indies, Turkey, Japan, and Brazil. China and India, while large producers, are small exporters.

Of all the tobacco produced, about one-fourth finds its way into world commerce and, of this, one-half is furnished by the United States, its nearest competitor being the East Indies which furnish one-tenth. Of this world's commerce, the largest importer is Germany followed by England. Europe takes three-quarters of the tobacco exported.

Most of the tobacco exported from the United States goes to England, China, Germany, France, the Netherlands, and Australia. We import cigar wrappers from Sumatra and Java, cigar fillers from Cuba and Porto Rico, and cigarette tobacco from Turkey and Greece.

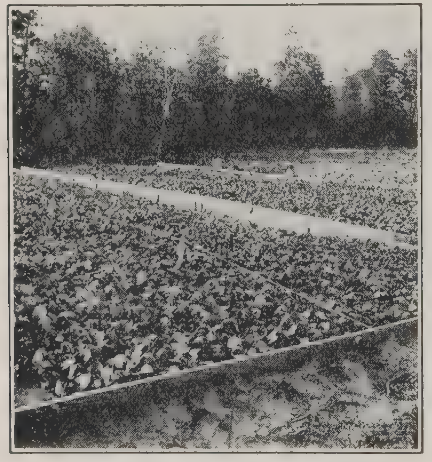
(Courtesy U. S. Department of Agriculture)

FIG. 82. TOBACCO PLANTS

Nearly three-quarters of our immense crop of tobacco is grown in four states—Kentucky, North Carolina, Virginia and Tennessee. The rest is grown mainly in South Carolina, Pennsylvania, Ohio, Georgia, Wisconsin, Connecticut, Maryland and Florida. Some states while not producing large quantities have an excellent reputation for special grades of tobacco, like Connecticut, Wisconsin, Florida, and Louisiana. Our principal markets are Louisville, Richmond, Durham, Key West, and Winston-Salem.

The Tobacco Plant. Tobacco grows over a wide range of climate. Its growing season is comparatively short, only three months. During the summer months it thrives well in the temperate zone providing the temperature is warm and moist. The soil should be rich in potash, but poor soils can be used if proper fertilizers are applied. Soil and climate, especially soil, have a great influence on the kind of leaf produced.

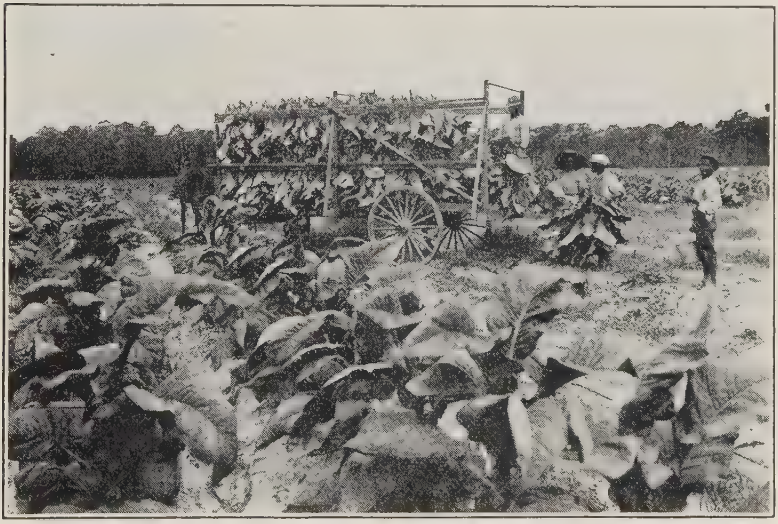
There is no article of commerce that lends itself to such a variety of grades and kinds as does tobacco. Skilled sorters can classify tobacco into hundreds of classes. Oftentimes leaves from the same plantation can be sorted into many different grades. These grades are determined by the type of leaf, the purpose for which it is intended, its aroma, the way it has been cured, its freedom from large veins, its gumminess, its elasticity, its color, and its burning qualities.



(Courtesy U. S. Department of Agriculture)
FIG. 83. SMALL TOBACCO PLANTS READY FOR TRANSPLANTING

How Tobacco Is Grown. Tobacco is grown annually from small seeds, so tiny that several hundred thousand are contained in an ounce. The seeds are planted early in the spring in carefully prepared nurseries. It is customary to mix the seeds with ashes before planting to give them better scattering and fruiting quality. When the plants are about six inches high they are transplanted, about four thousand to the acre, in long rows. This planting is done by hand generally, but on the larger farms machinery which makes a hole, places the plant in it, and presses the soil down around it is used. If the soil contains many cutworms, each plant is set out by hand, and a piece of paper or banana leaf is placed around it to prevent the worm from eating the tender stalk. Pests which eat the leaves are destroyed by spraying.

Later when the plant blossoms, the flower and sometimes some of the leaves are picked off to give greater strength to the remaining leaves. In the fall when harvest time comes, some farmers pick off the leaves separately, taking the lower leaves first as they ripen ahead of the others. Other farmers cut the whole plant down, slit it up the main stalk, and hang it over wooden poles. When the leaves are picked separately they are strung on string or wire.



(Courtesy U. S. Department of Agriculture)

FIG. 84. HARVESTING TOBACCO BY THE WHOLE PLANT METHOD

The Curing of Tobacco. The leaves are taken to a drying barn where they are cured by a natural circulation of air or by a heated draft, the temperature being carefully watched and gradually raised.

After being cured, the tobacco next goes to the fermentation barns. Here the small bundles are placed in large piles into which the thermometer has been placed in a pipe, so that it can be easily consulted from time to time. As the temperature rises in the pile, due to fermentation, the thermometer is often consulted, and when a certain degree of heat has been secured, the pile is torn apart and re-piled, the outer portion of the former pile being placed inside the next pile. This process is carried on until the desired amount of fermentation is obtained.

Then the tobacco is aged for from two to four years, depending upon the purpose for which it is intended. After being carefully regraded, it is blended with other kinds and is ready for manufacturing into smoking tobacco, plug tobacco for chewing, cigarettes, cigars, and snuff.

The Manufacturing of Tobacco. Cigars are made by stripping out the mid-rib of the leaf and rolling the piece together. A binder leaf is then rolled around this filler, and lastly a wrapper. This may be done by machinery or by hand. Plug tobacco, for chewing, is generally chosen because it has qualities which make it tough and gummy. Chicle and various sauces are added to the tobacco, and it is then pressed into molds in such a way that the outside is covered with a good looking leaf. Cigarettes are made from finely ground tobacco and almost wholly by machinery. Snuff is tobacco dust. Pipe tobacco is carefully blended, pressed into cakes, and then ground up to the degree preferred by various brands.

The waste from manufacturing in the form of sweepings, stems, and dust is used as fertilizer and in the making of plant sprays.

TEXT QUESTIONS

1. Is tobacco a product of the Old or New World? Prove.
2. How did the word nicotine get its origin?
3. Explain the importance of tobacco to Virginia.
4. What are the ideal growing conditions of tobacco?
5. How are the various grades of tobacco determined?
6. How is tobacco grown? Explain in detail.
7. Describe how tobacco is cured.
8. Discuss the ways in which tobacco is prepared and reaches market.
9. Where is tobacco grown? Consumed?
10. Name and locate the world's principal tobacco markets.
11. What is the relative importance of tobacco in commerce?

SECTION 2—VEGETABLES

Importance of Vegetables. Vegetables are very important to us as food. They furnish our bodies with starch for fuel and energy; with proteids for muscle and tissue; with mineral salts for bones and teeth; with acids for digestion; with bulk and roughage for our intestinal tract; and with vitamins without which we could not live. We get food from vegetables in the form of fruits like tomatoes; flowers like cauliflower; leaves like cabbage; stems like celery; roots like beets; bulbs like onions; and tubers like potatoes.

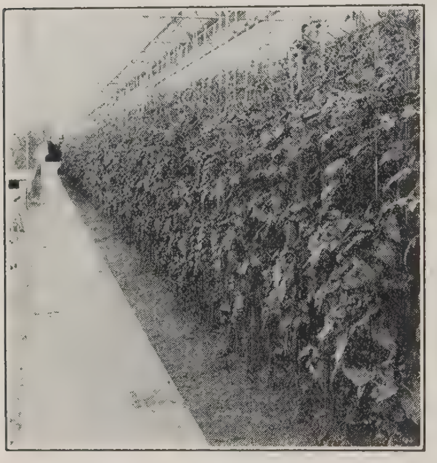
The use of vegetables is almost universal, ranging in quantity from the Chinese, who live almost wholly on rice and beans, to the Americans, whose daily food is one-quarter composed of vegetables. As our country becomes more thickly populated, we shall increase this proportion of vegetables in our diet. Dense populations tend to a vegetarian diet, because the scarcity of land compels them to raise the food supply which is most economical to produce.

(Courtesy U. S. Department of Agriculture)
FIG. 85. LETTUCE GREENHOUSE

Intensive methods enable the farmer to raise more food per acre in vegetables than in any other form. The fruit and vegetable industry in our country has risen to a place where its products are almost sixteen per cent of the farm crops in value. Their chief value is in domestic consumption, because of the large local demand, rather than in export trade because of their bulk in shipment and their perishable qualities.

History of Vegetable Growing. So far back does man's use of vegetables extend, and so varied and so scattered over the world is it, that it is impossible to follow the industry as a whole. The New World gave to Europe three important contributions to food vegetables—the potato, the sweet potato, and the tomato. The early colonists brought seeds of the common vegetables with them from the Old World. Learning many valuable lessons from the Indians, they soon found how to adapt the culture of the imported seeds to local conditions, with the result that some remained the same in character, while others took on different qualities, especially when crossed with native kinds.

From colonial times to within comparatively recent times, the growing of vegetables was purely a local affair, each family growing practically all they consumed. With the great strides in transportation facilities, coupled with the tremendous increase in our urban population, there have arisen two types of vegetable growers. One has practised vegetable culture near the large centers of population and is called a market gardener. The other has located further away from the cities, in places favored more by climate or soil conditions, and is called a truck farmer.



(Courtesy U. S. Department of Agriculture)
FIG. 86. TOMATO GREENHOUSE

Market gardeners rely on cold frames and greenhouses for out of season and early production. Truck farmers rely on climate and transportation facilities to overcome their lack of accessibility to market.

The Geography of Vegetable Growing. We find the greatest emphasis in vegetable growing in regions where there is a large and dense population. The great mass of people in Europe depend upon vegetables for food. England, after raising much in the southern parts of the island, calls on her neighboring countries for millions of dollars worth of vegetables a year.

The early market of Europe is supplied with produce from the gardens of northern Africa, Algeria, and Egypt. In the eastern part of our country we find the Atlantic Plain busy raising vegetables for the large cities found there. The soil, a light sandy loam, is ideal for quick and early growing.

(Courtesy U. S. Department of Agriculture)
FIG. 87. FIELD OF TOMATOES

Early in December our green vegetables begin to pour into the cities from southern Florida, and then the area of production gradually moves northward with the season through northern Florida, Georgia, the Carolinas, Virginia, the southern part of New Jersey and Delaware, and summer finds them maturing in New York and New England.

Wilmington, Philadelphia, and Norfolk are natural shipping points to the large cities and immense freights move from them. Chicago and the cities of the Mississippi River find a somewhat similar movement from regions on, and north of, the Gulf of Mexico. California, with her wonderful all-the-year-round facilities for growing vegetables, supplies the cities west of the Rocky Mountains, and cans her great surplus. By means of modern transportation facilities and specially built cars, some of her produce is shipped eastward even as far as the Atlantic Coast.

Vegetable Culture. The truck farm must be so located that the climate and soil conditions are right; there must be an abundance of cheap labor and good transportation facilities. The raising of vegetables requires much hand labor at fairly cheap prices. Hand labor is required for transplanting young plants from the nurseries, weeding, thinning, picking, packing, and shipping. The southern Atlantic plain depends almost wholly on negro labor, as do the regions around the Gulf of Mexico. The truck farmer of California looks to the Chinese, Japanese, and Mexican labor. The market gardeners near our large cities find a source of cheap labor in the immigrants, who are especially good because they have been trained along this line in Europe.

(Courtesy U. S. Department of Agriculture)

FIG. 88. FIELD OF CELERY

The truck farmer has several risks in his work; pests of all kinds need constant fighting, the changes of weather are a cause of worry; the danger of frost is ever present in the early and later part of the season; there is also the peril of having the crop spoil on the way to market by delays in transportation, the possibility of finding a glutted market when the crop arrives, and the general uncertainty of price due to supply and demand conditions. More than all, he fears over-production because that will oftentimes lower prices below the cost of production.

Because the units of truck farming are so small, fifteen to twenty acres, it has been difficult for the growers to combine and coöperate to prevent some of the dangers of their service, as have the fruit growers in many parts of the country. Better organization and more coöperation would save much economic loss to all concerned.

TEXT QUESTIONS

1. Why are vegetables so important to us as food? What do they furnish us?
2. Show how we get vegetable foods from the various parts of plants.
3. Why are vegetables so important in densely populated regions?
4. Why do they not enter into foreign commerce more?
5. What vegetables did the New World give the Old World?
6. How has the improvement of transportation facilities affected the growing of vegetables as an industry?
7. Contrast market gardening and truck gardening.
8. Where does Europe get her early vegetables?
9. Explain the northward movement of truck gardening in the United States as the summer advances.
10. Why is the Atlantic Plain especially fitted for vegetable growing?
11. What are the leading vegetable shipping ports? Why these?
12. What part does California play in the vegetable industry?
13. What factors enter into successful truck gardening?
14. Why is a supply of labor so necessary?
15. Explain how this labor is secured in the South. In California.
16. What risks does the vegetable farmer run?
17. What has prevented truck farmers from combining?

SECTION 3—THE POTATO

The Importance of the Potato. The potato is a native of South America. It was carried to Europe by the Spanish explorers, where after a slow start it has become the most important food-vegetable grown. Its slow start is explained by the inferiority of the primitive tubers, but this has been overcome by cross-breeding, until we now have the present desirable product. In Europe, the popularity of the potato is due to the fact that it can be produced in large quantities in a comparatively small area and thus furnish to the large populations the cheapest form of food. In the regions outside the corn belt in Europe, it is also very important as an animal food for cattle and swine. Europe has learned to make starch, potato flour, and alcohol from its surplus.

(Courtesy U. S. Department of Agriculture)
FIG. 89. PLANTING POTATOES

In this country, there is a limited production because of the competition of other vegetables. It takes a relatively smaller place as a table vegetable here, although in value, the potato crop outranks all other vegetable crops put together. Our great corn fields make it unnecessary as a stock food. We have not yet found it practical to use our surplus in the form of alcohol, dried flakes, or potato flour, and so the ever present fear of over-production limits our planting to some extent.

It is estimated that we could produce sixty times as many potatoes as we do now without decreasing any other crop supply. A food shortage is not a present danger as long as this situation obtains. As increased food supply becomes necessary, we can turn to the dehydration processes and convert potatoes into powder and flour and so store up a considerable surplus against a possible shortage or crop failure, as well as for normal future use.

The Geography of Potatoes. We find the potato in South America, its place of origin, of very small importance. It prefers the northern hemisphere where it has been perfected. Europe produces over ninety per cent of the world crop, Germany alone growing about twenty-five per cent. Russia follows next in importance. France grows more potatoes than all the United States. The great northern plain stretching back from the Baltic is the potato patch of the world. In addition to the above countries in Europe, others of importance are Poland and southern Sweden. The yield per acre in Europe is large because of the intensive methods used. England imports many potatoes to supplement her production. Ireland is noted for her yield per capita.

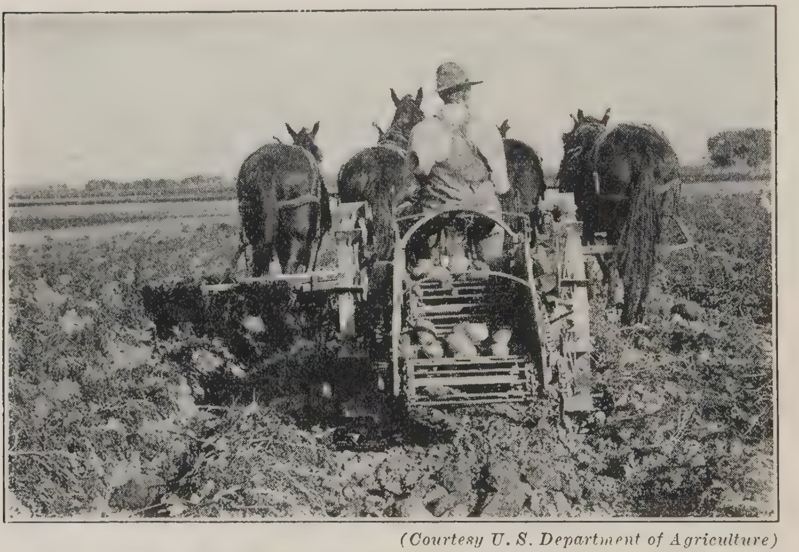
(Courtesy U. S. Department of Agriculture)

FIG. 90. SPRAYING POTATOES

The great bulk of potatoes in this country are raised in the northern and northeastern sections. Six states produce over half the crop, five of them bordering on the Great Lakes. New York, Michigan, and Wisconsin vie with each other as leaders, followed by Minnesota, Pennsylvania, and Maine. While much of the early crop is grown further south the great supply comes from these states. The growing of potatoes is practised in every county of this country, excepting those which, because of altitude or lack of water, can not grow them.

The Potato in Commerce. The potato figures rather low as a product in world trade due to the fact that it is bulky and perishable. It is rarely exported, except to countries near at hand as in Europe, or where transportation facilities make it possible to ship quickly and cheaply. It is essentially a product for home consumption. As a money crop it requires a large market, fairly accessible.

In this country the potato farmer is continually in the shadow of the fear of over-production. A year of plenty brings low prices while a year of scarcity brings high prices. This requires foresight of a season ahead and it is difficult to forecast. It also explains, somewhat, the lack of possible production in this country where the surplus means ruinous prices to the producer. Perfection in methods of conservation of the potato, in times of abundance, by converting it into potato flour, alcohol, or dehydrated slices, would remove this ever-present danger to the farmer and greatly increase potato growing. Many more farmers would engage in potato culture if they could be assured of a steady market and a reasonable price for their product. Co-operative associations are tending to help restrict production and to market the crop intelligently.



(Courtesy U. S. Department of Agriculture)

FIG. 91. HARVESTING POTATOES

The Sweet Potato. Next in importance to the potato, comes the so-called sweet potato, a native of America. It thrives well in our southern states where it forms one of the principal staples of food supply. It is very rich in starch and therefore is valuable as a food. It can grow as far north as New York in summer. Because it can do well on light sandy soils it is raised extensively, for the eastern and northern markets, in New Jersey, Virginia, and Maryland. Similar conditions are found in Iowa and some of the north central states where it is grown for Chicago and the other large cities of that region.

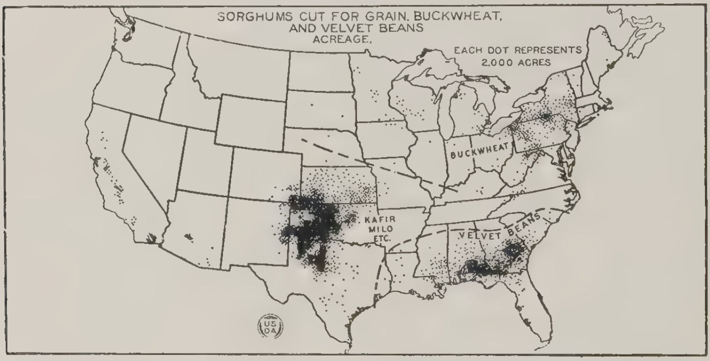
Because of the perishable nature of the sweet potato and its rapid decay in warm temperatures, its commerce is severely handicapped. It lends itself well to dehydration, and sweet potato powder and flour make a good addition to our flours. A mixture of wheat flour and sweet potato flour is very palatable. It could form a valuable addition to our food sources, in this form, should necessity demand it.

TEXT QUESTIONS

1. Explain the popularity of the potato in densely populated regions.
2. Why is it particularly popular outside the corn belt in Europe?
3. Contrast its use in Europe with its use here in America.
4. Discuss the geography of potato raising in the world.
5. Where are our potato farms in the United States?
6. Why is the potato not an article of importance in foreign commerce?
7. Why do we fear over-production in the United States?
8. How can we avoid the danger of over-production here?
9. Where are our sweet potatoes raised? Why?
10. What handicaps the commerce in sweet potatoes?

SECTION 4—THE LEGUMES

The Legumes. Legumes are vegetables which are valuable to our food supply because they contribute proteids or nitrogenous food, and thus in many cases are substitutes for our meat supply. They are called pulses in the Old World where they are grown much more than here, owing to the lack of a large meat supply. Legumes have the power to gather nitrogen from the air and to pack it into tiny sacks on their roots. For this reason they are particularly valuable to the soil, which they leave richer in nitrogen than before.


SORGHUMS CUT FOR GRAIN, BUCKWHEAT, AND VELVET BEANS ACREAGE.
EACH DOT REPRESENTS 2,000 ACRES
BUCKWHEAT
KAFIR MILO ETC.
VELVET BEANS
US DA

(Courtesy U. S. Department of Agriculture)

FIG. 92. ACREAGE OF BEANS, BUCKWHEAT, AND SORGHUM

The principal legumes are beans and peas, the former being found in the warmer climates, while the latter are found in the northern latitudes. Combined with starchy vegetables like potatoes, or starchy cereals like rice, they form an ideal combination, the mixture supplying both starch and proteids. As has been noted, the Chinese mix beans and rice for their principal food, while the combinations with starch cereals or potatoes and legumes in Europe constitute the principal diet combinations there.

The Bean. The bean goes away back in history as a food for man. In this country, three states stand out as leaders in bean culture. Michigan and New York raise them in regions too cool for corn; California raises them on soil too dry for corn.

Peas and beans form important crops for the Mediterranean countries which are too poor and crowded for an adequate meat supply, while in Asia Minor legumes, especially beans, are the mainstay as a food. In China and Japan, the soy bean is widely cultivated for its many valuable qualities, and its comparatively recent importation into this country promises a rapid expansion of its culture here. This kind of bean is very rich in nitrogen, has a valuable oil, and may be prepared as a food in many different ways.

Peas, for years, formed the principal vegetable of the common people in Europe, especially before the advent of the potato. They are widely used now either in a fresh or canned state. Dried peas are used the world round as a food.

The peanut comes under the heading of legumes and is fast being recognized as a valuable food, as well as a treat. It is very rich in proteids, and, in the form of peanut butter, finds a welcome as a meat substitute. Peanut culture is expanding, is now found in various parts of the South and is well established in Texas where its increase has been especially marked. In addition to its value as a human food, the peanut is also an animal food, pigs and cows being especially fond of it and its plants.

TEXT QUESTIONS

1. What are legumes? Why are they important as foods? As soil enrichers?
2. Why do we not use more legumes here? Why are so many used in China and in Europe?
3. What states lead in bean cultivation? Where are beans and peas grown extensively outside of our country?
4. Discuss the importance of the soy bean.
5. Show how peas have been and are an important food.
6. What is the probable future of the peanut? Why?

SECTION 5—FRUIT

Fruit. Fruit has become a necessity and is no longer a luxury. Up to fifty years ago almost every farmer raised enough fruit for his own supply and a small surplus for the nearby markets. With improved means of transportation, the fruit industry has followed the example of the vegetable industry. It has become more or less localized in specially adapted areas which depend upon the railroads to ship the products to the great centers of population and their markets. In this way fruit culture has spread itself out into climatically favored localities and is able to supply us with fruit the year around, as it can be transported great distances by specially designed cars and fast trains.

The Physical Factors in Fruit Culture. The principal physical factors which govern fruit growing are climate, water supply, and soil. The first is by far the most important, varying somewhat with the fruit to be raised. The more northern fruits, like the apple, the peach, and the pear, require a late spring to avoid the danger of too early budding and consequent premature exposure to late frosts which kill the fruit at this time. The summer following should be fairly clear and sunny so as to color and flavor the fruit. The autumn should be long and cool to allow the fruit to ripen well on the trees before the cold weather comes.

Sheltered places are sought for orchards. The lee shore of large bodies of water finds a natural protection from frost danger in that the winds are cooled in blowing across the water and retard the growth of the tree until frost danger is past. Places which have a high altitude are less liable to frost because of what is called frost drainage, which means that the cold air, with its frost, seeks the lower levels in the valley rather than the higher elevations. Sometimes the difference in temperature between the top of a hill and the valley nearby is twenty degrees. Through New England, peach orchards will invariably be found on high land for this reason, while the ridges in West Virginia are used for apple orchards. The Ozark plateau is likewise used for orchards.

The citrus fruits are very susceptible to frost, which, if too severe, not only kills the blossoms and buds, but also kills the tree itself. For this reason, citrus groves must be located in semi-tropical climates where the minimum temperature rarely falls below freezing. To combat an occasional frost, great precautions are taken by placing oil heaters and fires throughout the groves so that the air can be heated quickly.

The water supply should be adequate and well distributed, a condition generally found near large bodies of water and on the windward side of mountains. In the West there are many fruit orchards that depend wholly on irrigation for water supply and if this can be gauged to meet the requirements it is a most highly desirable situation.

Fruit trees require a good top soil, with a well drained sub-soil, so that water will not stand around the roots. A hard clay bottom or ledge results in too much water at times and not enough at other times. The soil should be friable and be capable of retaining sufficient moisture. In regions suitable for fruit growing, certain areas will be found to possess the proper soil requirements and will be selected in preference to others. Hillsides are preferred to level lands because of more perfect drainage conditions.

The Economic Factors of Fruit Growing. In addition to the physical factors, there are economic factors to be considered in selecting a location for successful orcharding. The proximity to market is a very important factor. Places that are distant from market can not get their crop out profitably in competition with locations nearer. Good transportation facilities are essential. The automobile truck has done much to favor the more removed locations, but a large commercial orchard should have, or be near, a railroad connection with the large markets. A sufficient labor supply must be present.

Fruit culture requires much intelligent hand culture, especially in harvest time when the fruit must be carefully picked and handled to avoid bruises and injury. In many orchards the labor is paid, not only by the quantity picked, but also by the care used in picking. Packing requires great attention to detail and careful handling. Coöperation among fruit growers is increasing. It has resulted in the formation of several coöperative associations which pick, pack, and market the crop of a whole fruit region, with the result that the pack is standardized, well advertised, and intelligently marketed.

(Courtesy Canadian National Railways)

FIG. 93. BLOSSOM TIME IN NIAGARA PENINSULA

Another economic factor which enters into fruit culture is the time of harvest. Fruit growers, favored by being able to pick and reach the market even a few days in advance of others, reap the benefit of a much better price.

The Apple. The apple is well known in history and is frequently referred to in classical literature. Its culture spread from Asia all over Europe, and many varieties were brought to this country by the colonists. As the pioneers pushed westward they carried apple seeds with them, until now some apples are raised almost everywhere in the United States, although the commercial production of apples is confined to regions best adapted to it. The breeding of new varieties, especially with native stock, has led to thousands of varieties, although the commercial varieties are confined to about fifty.

Some apples are raised in Europe, especially in Germany, France, Russia, and England, but we export annually great quantities to Europe to supply its deficiencies. The apple crop in Canada is the only fruit crop of importance. British Columbia, a region near Lake Ontario, and Nova Scotia are the principal regions of apple culture in Canada.

In the United States the apple crop exceeds in value all the temperate zone fruit crops combined. The value of citrus fruits amounts to less than one-half the value of the apple. The apple is by far the most popular fruit in the market, and ranks high because of its keeping qualities, its various uses, and its relative cheapness.

The location of commercial orchards is governed largely by climate. New York is a large apple grower, especially along the southern shore of Lake Ontario where the winds from the lake prolong the budding of the trees until frost danger is past. For a like reason the eastern shore of Lake Michigan shows many orchards. The ridges of the Appalachian district, from Maine to North Carolina, possess many apple orchards. This is due in part to favorable climatical conditions of frost drainage and somewhat to the impetus of an early start.

There is a large apple area in West Virginia and Virginia, in the hills of the Great Valley, and the eastern slope of the Blue Ridge section. Southeastern New York is favored with a suitable climate and also nearness to New York City. A section in Arkansas, in the Ozark Mountains, is famous for its apples. Here we find also the frost drainage factor important.

In the far West, Washington, Oregon, and California have large orchards under irrigation. These regions produce an apple which finds a ready market in the East because of its color and appeal to the eye. The sunny conditions of these western orchards produce a beautiful looking apple which comes well packed in boxes and is particularly popular with the fruit dealers because it is well graded, keeps well, and is a good seller. The eastern apple is packed in barrels, is smaller and less attractive to the eye, but is rapidly gaining popular favor because of its excellent eating qualities. Most of our exported apples go to England which takes practically all of our surplus.

Peaches. Peaches first grew in China and came to America by way of Europe. The principal source of peaches is now in this country. The American peach surpasses in every way its Chinese parent. Because of its colder climate, Europe is unable to grow the peach except in Italy and southern France. In the more northern countries, it will grow, only with the greatest care, in hot houses or in warm, sheltered places. The peach culture has grown rapidly since the Civil War and now ranks next to apples in the temperate zone fruits.

The peach is more affected by climate than is the apple, although it thrives well in most of the apple districts. We find it being grown commercially in the apple regions of New York and Michigan because the tempered winds from the lakes hold back the budding time. It also does well on the ridges in Connecticut and the Virginias, and on the Ozarks because of the same frost drainage conditions which favor apple culture. It still is an important crop in its original home in Delaware, New Jersey, and Maryland. It goes further south than the apple, and our southern states, especially Georgia, find it a great source of income.

The warmer southern states have the great advantage of raising peaches which reach the market well in advance of the bulk of the crop from other regions. California raises over one-third of our entire crop, sending some of it eastward, even to England, and canning her immense surplus.

The peach industry has spread itself over these widely separated regions because of climatic reasons, but it is dependent upon the rapid and efficient transportation facilities now afforded in getting its crop to market. Because of the many different states they come from, it is now possible to have fresh peaches from May until fall, as the different harvests ripen.

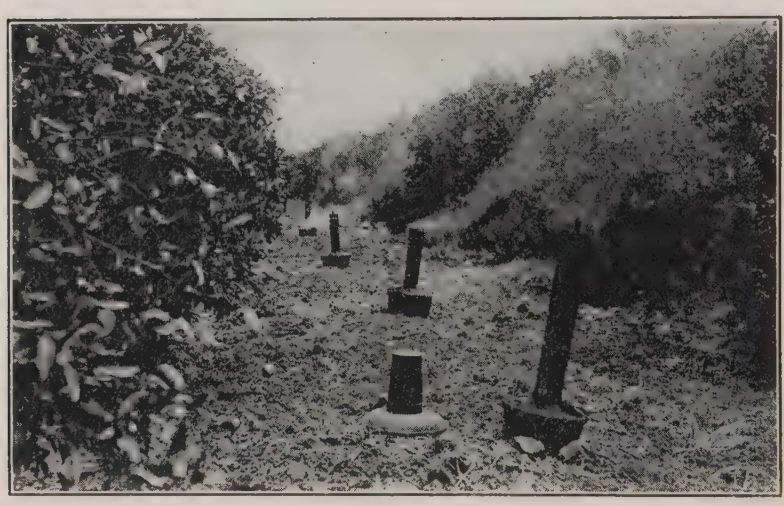
(Keystone View Company, Inc., N. Y.)

FIG. 94. ORANGE GROVE IN CALIFORNIA

Citrus Fruits. The principal citrus fruits that enter into commerce are the orange, the lemon, the grape fruit, the lime, and the citron. They lend themselves to commercial handling because they are well protected from injury by their tough skins. In this country, the first three are the most important. The orange has been well known for centuries, although not widely raised until quite lately.

The orange and the lemon have been grown commercially in Italy, Sicily, Spain, and Portugal for the European market. Asia Minor also raises some excellent citrus fruits, especially oranges. China and Japan are well located for orange growing. Brazil and other semi-tropical countries in South America, the West and East Indies, are also producers. Throughout the tropical zone, oranges are found almost everywhere. In this country, we find two regions which are adapted to citrus fruits, Florida and California. Both these sections came into prominence as orange growers with the coming of rapid transportation connections with the northern markets.

Florida was stocked with oranges by the early Spanish explorers and the fruit did well there. Since the coming of through routes of railroads, the industry has expanded rapidly. The great frost of 1894, which killed thousands of trees, resulted in the moving of the groves to the central and southern regions of the state where frost danger is less. Florida has the advantage of a plenteous rain supply and is nearer to market, but is in greater danger from frost than California. Florida oranges are noted for their juiciness and sweetness.



(Keystone View Company, Inc., N. Y.)

FIG. 95. HEATERS ARE USED IN ORANGE GROVES WHEN THERE IS DANGER OF FROST

California has the advantage of a more steady climate and less danger from frost, but is compelled to raise her oranges under irrigation and is farther from the markets of the East. Her oranges are large and the navel orange, which is produced here, is highly sought after because of its ease in peeling and lack of seeds. The navel orange was brought into California from South America through the agency of the United States Agricultural Department.

The orange industry has grown rapidly in the last fifty years and the acreage of the orchards is fast expanding. One possible danger to the industry lies in over-production, because of large natural production all over the tropics. Should the time arrive when the demand is less than the supply, production will be unprofitable.

So far the demand has increased with the supply and favorable prices have kept the citrus growers prosperous, except in the years of disastrous frosts, such as in 1894 in Florida, and 1913 in California. In value the citrus crops are second among the fruit industries, apples outranking them.

Orange growers have organized into large coöperative associations which oversee the picking, packing, and marketing of the crop, which continues practically the whole year round. These associations have done much to eliminate waste and loss.

While we still import a large part of our lemons from Sicily, California also has extensive lemon orchards and she is fast taking care of the domestic demands. The grape fruit is a product which has gained favor on the tables of our country within recent years. Florida and Porto Rico are the greatest sources of supply.

TEXT QUESTIONS

1. What changes have taken place in the last fifty years in fruit growing? Why?
2. Show how each of the three physical factors affect fruit culture.
3. What are the ideal conditions for apples, pears, and peaches?
4. What is frost drainage? Why is high land best for fruit in the northern regions? How do large bodies of water afford frost protection?

5. How is the danger of frost avoided in citrus groves?
6. Why is dependable irrigation preferable to a natural rain supply?
7. What soil conditions are required in fruit growing?
8. State the economic factors in fruit growing and show how each affects it.
9. Where did apples originate? How did their culture spread westward in the United States?
10. How is the apple demand in Europe supplied?
11. What is the relative value of the apple crop in regard to other fruit crops in the United States? Why?
12. Where are apples grown in Canada?
13. Where are apples grown commercially in the United States? Why?
14. Contrast the eastern and western apple industry in this country.
15. Where did the peach originate? In what country are most of the peaches of the world grown today? Where are they grown in Europe? Why?
16. What are the leading peach regions in the United States?
17. How does California handle her immense crop of peaches?
18. Show how transportation makes it possible to have peaches in the market for a long season.
19. What are the chief citrus fruits? Which is the most important?
20. Where are oranges grown outside the United States? In the United States?
21. Contrast Florida and California as orange growers, giving the good and bad points of each.
22. Where do most of our lemons come from? The grape fruit?
23. How are orange growers organized? Why?

SECTION 6—FRUIT (Concluded)

Grapes. Grapes have been known to man as far back as history goes. We find the ancient Egyptians eating them. The Romans and Greeks pressed them out into wine. Vineyards and grapes are frequently referred to in the Bible showing that they were common then. For centuries Europe has cultivated the vine for wine and raisins. France, Italy, Spain, and the regions of Central Europe now lead the world in the making of wine. In South America we find Argentina leading in wine making. The Asiatic people are not great wine drinkers. This is due in part to the Mohammedan religion which forbids the use of alcoholic liquors.

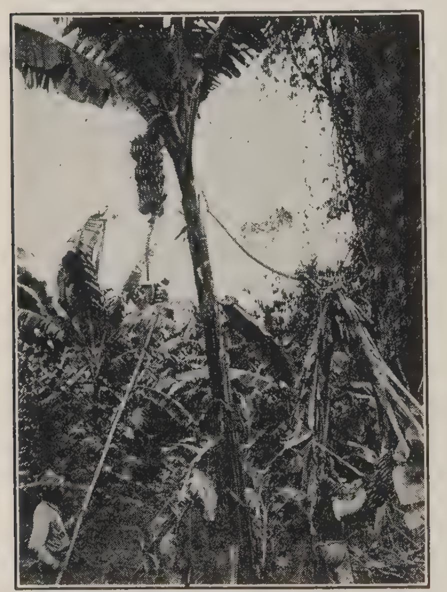
Our colonists brought the European varieties of grapes with them but because of the damp climate of the eastern seaboard, which caused diseases in the vines, these varieties did not do well and the people turned to the native vines. By careful selection and cultivation, these native grapes soon became highly desirable, especially for table use. Grape culture has become important in two distinct regions in the United States: the region in western New York and near the Great Lakes; and the California region.

In the eastern section native grapes only are raised. These are used for the table, and also for a large and growing grape juice industry. California raises the European varieties, because her climate is similar to that of the Mediterranean countries where these varieties are found at their best. Formerly, California made much wine, but her grape industry has now turned to raising grapes for raisin demands. Some of her grapes are excellent for table use also.

Pineapples. The pineapple was first a native of the American tropics, but was early transported to Europe, where its culture spread under artificial conditions. It is now a favorite tropical fruit in the markets of the United States, and to a lesser degree in the European markets.

The principal sources of production of pineapples for our country are found in Hawaii, Porto Rico, Isle of Pines, Cuba, Florida, and California. Hawaii produces immense crops, shipping the fruit fresh and canning a large surplus. Europe gets most of her supply from the Azores, the West Indies, and some from northern Africa.

The Banana. One of the most remarkable facts in recent commerce and industry has been the rapid development of the banana trade. Bananas thrive in tropical climates wherever there is sufficient rainfall. The banana is rich in starch and has been one of the chief food plants of the tropics for a long time, but because of its perishable qualities, was a rarity in the temperate zone markets until within the last few decades.



(Keystone View Company, Inc., N. Y.)

FIG. 96. BANANA TREE IN COSTA RICA

With their wonderful organizing ability and large capital, the people of the temperate zone have entered into the banana trade and developed it to its present high stage. Regions favorable to its growth have been laid out in large plantations. Railroads have been built to bring the fruit to the coast, where it is loaded into large, fast boats, which bring it to our markets, in which it is sold so cheaply that oftentimes it is more economical than fruits grown right here at home. The banana trade is an excellent illustration of the use of a tropical source of food supply by intelligent methods employed by the temperate zone initiative.

The banana grows in bunches, on a long stalk, which is cut back after the bunch is cut off and which produces again in a year without further attention. The bunch of bananas is shipped while green, the ripening process occurring either on its journey or at the market.

The principal source of supply for the United States, by far the greatest consumer in the temperate zones, is found in the countries of Central America and some of the West Indies, principally Jamaica. The European supply comes from the islands off the west coast of Africa, and from tropical America.

Fruit Preservation. We have already seen how the fruit and vegetable industries have grown with the coming of rapid and effective transportation facilities, which have increased the area of production and consumption. There also has been a great increase in the preservation of fruit in a dried or canned form for later use. This is done by modern methods and a great amount of waste and loss is avoided.

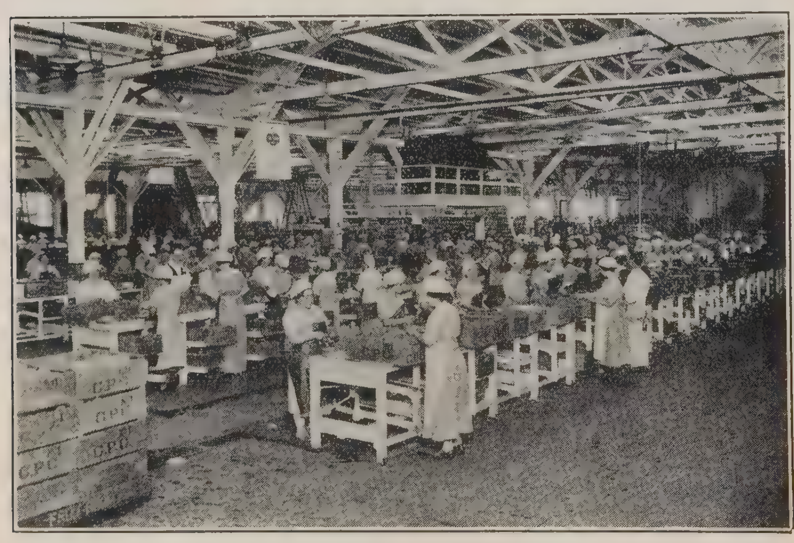
Dried and canned vegetables and fruit have added, in quantity and variety, to the food supply of our large cities and also of the out-of-the-way places, far removed from the sources of supply.

Dried Fruit. Formerly much of the fruit was dried locally, often under adverse conditions. In the northern regions, dampness sometimes prevented a complete drying, and lack of sunshine at critical periods made the fruit dark and unsightly. Now most of the drying is done in countries which have sunny, rainless climate, like California and the countries around the Mediterranean Sea. Later this fruit is transported to less favored regions.

From the countries in the southern part of Europe, we get dried figs and dates and raisins. In California, the conditions for drying are ideal. There the peaches, apricots, prunes, and raisins may be dried in trays, in the sunshine, without any resort to artificial means. This gives them an inviting appearance as well as a complete drying.

Almost all of the dried fruit in this country, with the exception of dried apples, comes from California. New York leads in apple drying.

Canning Industry. The canning industry received a great impetus during the last half of the last century, and by 1880 had become really important. This industry is still somewhat scattered, owing to the location of some of its factories near the source of supply. The railroads, however, have a tendency to bring the canning industries into centers where factories make the process cheaper.



(*Photograph by Ewing Galloway, N. Y.*)

FIG. 97. FRUIT CANNING IN CALIFORNIA

During the past twenty-five years, great strides have been made in canning new varieties of vegetables and fruits, so that now almost any one of them is available. Corn, tomatoes, peas, and beans are the principal vegetables canned and are nearly equal in value. Tomatoes lead in quantity.

Baltimore is a leading canning center of vegetables, and is favored by being able to draw its supply of raw materials from the nearby truck regions. It is near to the eastern markets, and makes use of its canneries in winter to can the oysters from the Chesapeake beds. Some states which raise sweet corn for canning purposes lie outside of the great corn belt, because the corn is canned before fully ripe, which permits a shorter growing season. The leading corn canning states are Illinois, Iowa, Maryland, and California.

The canning of baked beans is growing rapidly and is not dependent upon local sources of supply as the beans will not spoil. The north central states lead in canning beans.

California is well ahead of all others in fruit canning; she is far from the market for fresh fruit and has an immense surplus crop. She gives us almost all our canned apricots, asparagus, peaches, and pears. Oregon and Washington excel in canning berries.

TEXT QUESTIONS

1. Prove that the grape was well known in ancient times.
2. Why are native varieties of grapes popular in the East?
3. Why are the European varieties raised extensively in California?
4. Where are grapes raised in Europe? Why?
5. What effect has prohibition had on the grape industry in California?
6. Where are pineapples raised extensively? Where does Europe get her supply? The United States get her supply?
7. How is the surplus pineapple crop cared for?
8. Show how the banana trade has expanded under intelligent organization.
9. How is the commercial banana grown? Transported to market?
10. What are the principal regions of production?
11. What effects has the preservation of fruit by canning or drying had on our food supply?
12. Where is the dried fruit industry located? Why?
13. What state leads in apple drying? Why?
14. Where is the leading vegetable canning industry located? Why?
15. How does Baltimore use her canneries the year round?
16. What states lead in canning corn? Why?
17. Name other important canning regions and tell what they specialize in. Why?

SECTION 7—MISCELLANEOUS PLANT PRODUCTS

Spices. For centuries, man has flavored his food with certain vegetable products which are called spices. During the time when trade was confined to luxuries, spices played a more important part in commerce than they do now that the great bulk of the world trade is in necessities. Spices are used all over the civilized and semi-civilized world. Some of the great discoveries of history were due, in part, to the desire to find an all-water route to India and the East in order to secure Oriental products, among which spices had a very important place. The competition to secure this trade later resulted in the British domination of India and so it has been said that pepper made India a part of the British Empire.

Black pepper and white pepper come from the same plant. The difference in treatment of the fruit results in the difference between the two peppers. Singapore is the great pepper shipping port. Pepper is grown in the Malay Peninsula, Siam, the West Indies, and the Philippines. Red pepper, sometimes called cayenne pepper, is from a wholly different plant called capsicum. It is grown in Spain, Mexico, Central and South America, where it is extensively used.

Ginger comes from the dried roots of a plant and is found in most tropical countries. It is extensively grown for commerce in China, Indo-China, India, Africa, and Jamaica.

Nutmegs are the kernels of fruit which grows in the East Indies, Zanzibar, the Moluccas, the West Indies, and South America. The covering of the kernel is the mace of commerce. The white appearance of nutmegs is due to a covering of lime.

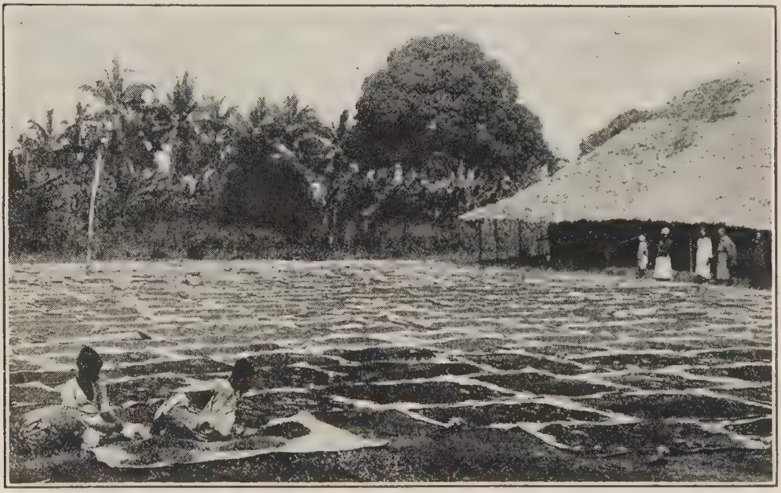
Cinnamon is the bark from a tree which thrives in Ceylon, the West Indies, South America, and southern Asia.

Allspice, sometimes called pimento, is the unripe berry of a plant which thrives best in Jamaica, the West Indies, and the East Indies. Its popularity is due somewhat to its cheapness.

Cloves are the dried flower buds of a tree which grows best in the Moluccas, the East Indies, the West Indies, and

Zanzibar. They are used extensively in pickling and in confectionery. The oil of cloves is used in medicines and in dentistry.

Vanilla is the oil extracted from a pod which grows in Mexico, Central, and South America. The pods are allowed to dry slowly and to ferment slightly and are then cured to allow the flavor to develop. The oil is extracted either by pressure, or by chemical processes. The poorer grades form one of the popular flavorings in candy, ice cream, and soda.



(Keystone View Company, Inc., N. Y.)

FIG. 98. CLOVE DRYING IN ZANZIBAR

In the temperate zone, mustard is the principal spice grown. It finds favorable conditions in America and in Europe, and is also found in Asia and the East Indies. It is made from tiny seeds of the mustard plant, which are ground up into very fine powder.

Caraway seeds are grown largely in northern and central Europe and in the United States. They are used to flavor bread, cakes, and liquors.

Vegetable Medicines. From time immemorial, herbs and plants have furnished medicines. The more important ones are opium, quinine, cocaine, sarsaparilla, licorice, aconite, rhubarb, arnica, belladonna, castor oil, and ipecac.

Opium is the juice of the poppy, and from opium we get laudanum and morphine. All three are used as opiates. Their abuse, rather than their legitimate use, has been very harmful, especially to Oriental races. There is now a concerted attempt by the nations to limit the growing of the opium poppy to the needs of medicine only. The allowing of the growing of poppies to supply opium to its slaves has been one of the disgraces of the civilized nations. Opium is now produced in India, China, Persia, and Asia Minor, where it brings large revenues from taxation.

Quinine comes from the bark of the cinchona tree, which is a native of South America, where it thrives in Peru. For this reason, it is sometimes called Peruvian bark. It has been transplanted to the East Indies with success, and much of the commercial supply is raised in these islands. Quinine is the favorite medicine for malaria.

Cocaine comes from the coca plant, and is one of the opiates used in medicines and by dentists. It comes chiefly from South America.

Castor oil is the oil extracted from the castor bean which grows well in Asia and North America.

TEXT QUESTIONS

1. Name some of the more important medicinal plants.
2. From what is opium made?
3. Where is opium produced? Why is it a source of revenue?
4. From what does quinine come? Where is it grown?
5. Where does cocaine come from and what is it used for?
6. From what does castor oil come? Where does it grow?
7. Explain the decline of spices in relative importance in world commerce.
8. Show how the demand for spices and other Oriental articles caused the discovery of America and the British rule in India.

9. Name the kinds of pepper. What do they come from? Where are they grown?
10. What is ginger? Where is it grown?
11. What are nutmegs? Where are they grown? Why are they white in appearance?

PROBLEMS AND PROJECTS

1. Contrast the attitude of the government in this country and in Europe in regard to the tobacco trade.
2. Make an outline map showing the principal tobacco growing regions. On another piece of paper give the reasons why tobacco is raised in these regions.
3. How are the various blends of tobacco maintained in regard to the evenness of their qualities?
4. Explain why the large truck farms are chiefly in the South and the large market gardens principally in the North.
5. Why do most of our sweet potatoes come from the South and most of our white potatoes from the North?
6. Make a list of vegetables that appear on our tables each month throughout the year. Where does each one come from?
7. Discuss how legumes form an important part in the diet of people who have to go without much meat.
8. Make a list of fruits that appear on our tables each month of the year and tell where they come from.
9. Describe the methods of packing and transporting our most important fruits that come from a distance.
10. What fruits are cheaper to raise outside the United States? Why?
11. If you were to become a fruit grower what kind of fruit would you raise? Why? Where would you locate? Why?
12. What kind of grapes do you prefer? Why? Where do they come from?
13. List all of the canned vegetables and fruits you can locate in some store. Where does each one come from?

14. Discuss the effect of climate on the dried fruit industry.
15. Show how canning and drying fruit make it possible for distant places to have them for use.
16. Make a list of the spices used in the kitchen.
17. Make a complete list of the more common drugs. Where do they come from? What are they used for principally?

TOPICS

1. The effects of tobacco.
2. The need of vegetables in our diet.
3. The green vegetable markets of our large cities.
4. Commission houses and their work.
5. Fruit growers associations and their results.
6. Pests that attack vegetables.
7. Pests that attack fruit trees.
8. Tropical fruits.
9. The United Fruit Company and its work.
10. The international trade in opium.
11. The opium trade and history in the Orient.
12. How drugs are controlled in the United States.
13. Spices.

FOR CLASS DISCUSSION

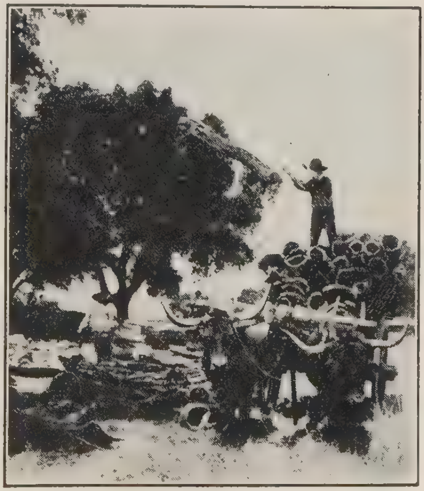
1. Opium is more of a curse than benefit to the human race.
2. A vegetable diet is better than one with meat.
3. Increased consumption of tobacco is a menace to health.
4. The elimination of commission houses would benefit the fruit business.
5. Destroying crops is justifiable to prevent overproduction.
6. The fruit growing industry offers a good chance for investment.
7. Truck gardening offers a good future as a business.

CHAPTER XV

FOREST PRODUCTS

SECTION 1—LUMBERING

Importance of Wood. Wood is one of the most essential articles of commerce. Lumbering and the use of wood form one of the leading industries of the world and rank very high in our country. Through the ages, man has looked to wood for his shelter, his fuel, his implements of peace and war, and his vehicles of transportation, especially ships.



(*Keystone View Company, Inc., N. Y.*)

FIG. 99. GATHERING CORK IN PORTUGAL

More recently the use of wood has become increasingly important in land transportation, in the form of railroad ties and bridges. The transportation of great quantities of articles in commerce requires countless crates and boxes. Modern systems use much wood. Thousands of trees have been made into telephone poles. Annually great quantities of wood are used in making our beautiful furniture and musical instruments.

With the inventions of printing and wood pulp paper, the forests have made possible the tremendous spread of the knowledge upon which our modern society rests. The rapid and wonderful growth of our country would have been impossible without the presence of our forests, which supplied the enormous amounts of lumber with which we built our houses. Every day wood enters into our lives in very necessary and vital ways.

Kinds of Wood. Wood is classified as soft and hard. Soft wood comes from the cone-bearing evergreen trees and is easily worked with tools. It is used principally in construction work, especially in the building of houses. Hard wood has a finer grain, takes a better polish, and is harder to fashion with tools. It is used for furniture, floors, and cabinets.

The principal soft woods are pines, firs, hemlock, spruce, cypress, redwood, cedar, larch, and tamarack. The principal hard woods are oak, maple, poplar, gum, chestnut, beech, birch, basswood, elm, cottonwood, ash, hickory, walnut, sycamore, and cherry.

The soft woods grow better in the northern latitudes, although we find some in the higher altitudes of the southern part of our country. They form the principal lumber supply here and in Russia. Some kinds of pines are rich in turpentine, pitch, tar, and rosin, which are called naval stores because they are used on ships. The white pine is the most prized of the soft woods, because of its excellent working qualities. It is fast disappearing from our forests because of the great demand. Russia still has much white pine, although the difficulties of getting it to market are so great that it has not yet entered extensively into commerce. Our southern pine is now the greatest source of lumber. It is somewhat harder than our other pines.

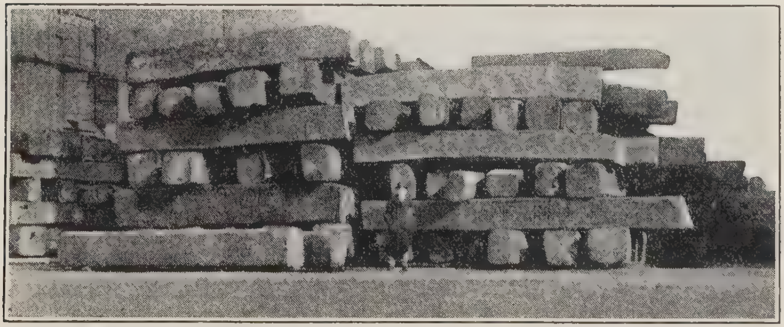
Cypress is now being used for finish wood. The cedars make fine cabinet woods and also pencils.

Spruce has been prominent in our lumber supply, especially for construction. The smallest trees enter extensively into the making of paper pulp.

Redwood grows only on the Pacific Coast. It is popular because of its fine grain and is used in building and in the making of shingles and clapboards.

Douglas fir is second only to southern pine in regard to the quantity cut in this country. Because of its straight grain and large boards it is well adapted to construction work. It is the favorite export wood.

Our hardwood forests lie somewhat south of our softwood forests. Oak is used to make many of our cabinets. It has a beautiful grain, takes a high polish, is strong and tough, and wears well. It is in great demand and is exported to some extent. Hickory is used almost wholly for agricultural implements, spokes in wheels and tool handles. Walnut is one of our favorite furniture woods.



(Keystone View Company, Inc., N. Y.)

FIG. 100. IMPORTED MAHOGANY

Much of our early American furniture was made of maple. This wood is now used frequently for floors and cabinet work. Our cheaper furniture is constructed largely from birch which, because it takes stain so nicely, frequently imitates higher priced woods. Gum wood is now popular, not only as a cabinet wood, but also for interior trimming in houses. It has a smooth, fine grain.

The tropical woods are all classified as hard woods. Because of their beauty, they are used almost wholly in furniture, cabinet making, and musical instruments. Mahogany is the favorite piano and furniture wood, and comes from tropical America, mostly in the form of logs because of the greater and more economical facilities for handling them here. Ebony comes from the East Indies. We find it chiefly in piano keys. Jarrah is an Australian wood used for street-paving blocks. Teak comes from India and is popular on ships because it resists marine insects of the tropics and is strong and durable.

Boxwood has a very fine grain. Rulers and some other instruments are made from it. It grows in India and the Mediterranean countries. Lignum-vitae is a very hard wood coming from tropical America. It has some medicinal properties, hence its name "wood of life." It is used for tools which require a non-splitting wood, such as mallets and pulleys, and in the tropics, for railroad ties because of its resistance to moisture and insects.

Bamboo, the favorite wood of tropical countries, lends itself to the making of all kinds of light furniture, houses, and even clothing. It grows rapidly and is a source of shelter, clothing, and food. Camphor trees are grown for their medicinal properties and their value in explosives. They are also popular for piles in water. Mulberry trees in Japan, China, and India are the food source of millions of silk worms. The rubber trees of the tropics are a great source of commercial products.

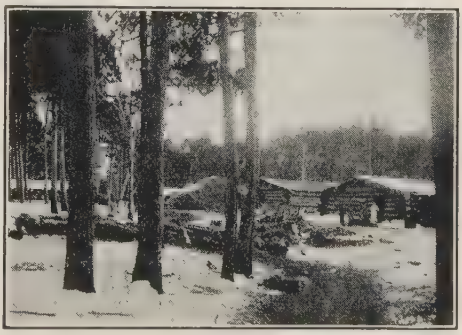
The Geography of Lumbering. Trees are found all over the world where sufficient rainfall is found. Two general belts may be distinguished. The tropical trees form a belt around the world near the equator and supply us with the beautiful hardwoods, mahogany, rosewood, ebony, and sandalwood. In the northern temperate zone we find another great forest belt extending across Asia into Europe and across the United States and Canada. It is from this belt that we get our famous softwoods like pine, spruce, redwood, and Douglas fir, and our hardwoods like oak, maple, and birch.

The principal producer of lumber in the world is our own country which supplies over fifty per cent of the world supply, or more than all the other countries combined. Other countries of importance are Canada, Japan, Russia, Finland, Sweden, Norway, the northern and central countries of Europe, and Brazil.

The countries of the Old World have drawn so heavily on their forests that now they do not supply enough for their own use and are obliged to import largely, although the Scandinavian countries and Russia still produce for export.

Our own forests have been greatly depleted because of our wasteful methods and the great domestic demand. We still export large quantities, especially of softwood, to Japan, Australia, the River Platte region, Cuba, and China. Our hardwood export is taken chiefly by the British Isles, Canada, South America, Africa, and Mexico.

Most of our imports come from Canada. Our tropical woods like mahogany, Spanish Cedar, rosewood, and others are still imported in the form of logs. Large quantities of pulp wood come from Canada and Norway. Cork comes from Spain. Our lumber exports amount to about 7% of our cut. Our imports are about 5% of our production.

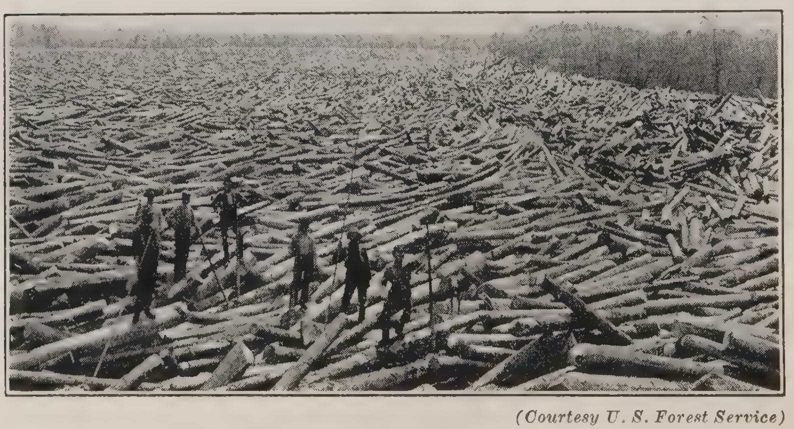


(Photo by Bliler, Courtesy U. S. Forest Service)

FIG. 101. A LUMBER CAMP

Forest Regions of the United States. We may classify the forest regions of the United States into seven areas: (1) the northeastern, which covers New England and New York; (2) the Great Lakes region, which takes in Michigan, Wisconsin, Minnesota; (3) Appalachian Highlands, extending from New York southward; (4) southern district, including the coast states and lower Mississippi basin; (5) the hardwood district, stretching westward from the Appalachian Mountains to the Mississippi River and northward from Alabama to the Great Lakes; (6) the Rocky Mountain district; and, (7) the Pacific Coast regions west of the Rocky Mountains from California to Washington.

The lead in lumbering was first held by the northeastern district, then by the regions around the Great Lakes, and now the southern district is far ahead of all others. The lead will eventually pass to the Pacific Coast regions as the southern forest supply diminishes. The Appalachian Highland district is handicapped by topography. The hardwood district has been the source of a steady supply, but will never lead in production because of the greater demand for soft woods. Each one of these forest regions possesses some features peculiar to it and a brief description of each will be worth while.



(Courtesy U. S. Forest Service)

FIG. 102. LOG DRIVE, GLEN FALLS, N. Y.

The Northeastern Section. New England forests were the first to fall before the lumbering industry. The excellent pine, which came from the Maine woods, gave Maine the name of "Pine Tree State." With so much good lumber so near the ocean, shipbuilding developed and the shipyards of New England built some of the finest sailing vessels known.

Because of the long winters, when farming activities were at a standstill, New England farmers supplied the labor factor by going into the forests as lumbermen. Camps were built, roads opened, and everything prepared for the coming of snow. The logs were hauled to the side of the wood roads, loaded on sleds and then carried to the ponds or streams, where they were piled ready for the breaking up of the ice in spring. When the spring freshets came, the logs were floated down the rivers and streams to the saw mills, the lumbermen becoming the log drivers. These mills located near large falls where water power was available.

Bangor at the falls where the Penobscot River meets tide water, was the leading lumber center of this district. The principal woods of this district were pine and spruce.

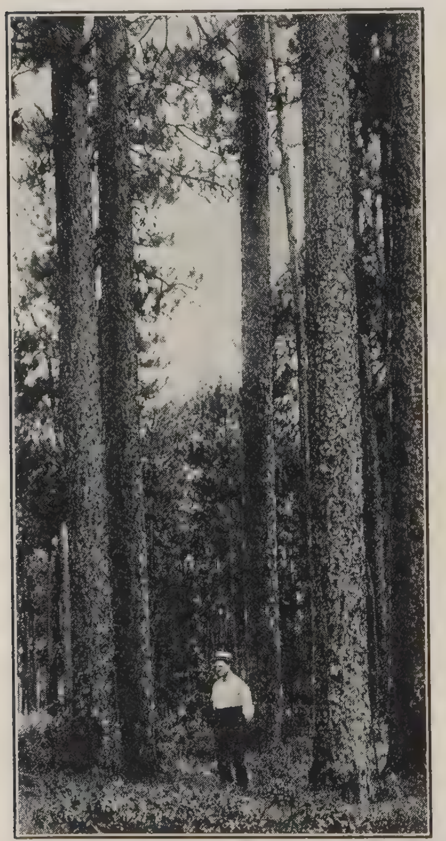
As the forests withdrew farther and farther away from the available streams, and transportation became more and more difficult and costly, the lumbering industry sought new fields of endeavor. Lumbering in New England today is confined principally to the cutting of pulp wood, which is smaller and, in most cases, second growth timber on old locations which have previously been cut over. The lumbering here is now carried on principally by French Canadian labor. The biggest pulp mills of our country are located within this district, and at Holyoke we find the greatest center of paper manufacturing.

The Great Lakes Region. The successor to the northeastern district was the district around the Great Lakes, which supplied practically the same kinds of woods, pine and spruce. Michigan became the leading lumber state and then the leadership shifted westward to Wisconsin and Minnesota. Chicago became prominent as a lumber market. Minneapolis was finely located for a lumber center with the St. Anthony Falls supplying the power to saw the lumber from the districts around this city. As the lumber supply began to decrease, Minneapolis converted her mills to flour mills and has become the leading milling city of the world.

The labor demand in this district has been, and is now, supplied by laborers who follow a unique annual migration. In the spring, they follow down the Mississippi River and begin to work as harvesters in the wheat fields of northern Texas, working northward as the harvest goes, until, in the late fall, we find them in the northern wheat fields. As winter approaches, they go into the woods of Michigan, Wisconsin, and Minnesota, only to begin their cycle again in the spring.

It was during the leadership of the lake district that Grand Rapids became prominent in the manufacturing of furniture. This city has held her lead until today she is the recognized center of this industry.

The Southern District. This district reaches from New Jersey, down the southern Atlantic Coast, and around the Gulf of Mexico to Texas. It furnishes almost half our lumber supply now. Its most important trees are the hard pine and cypress. The long-leaf pines of this district are the source of our naval stores. This district is fairly level and permits the building of temporary logging railroads through the forests. Logging here is carried on the whole year round. The trees are felled, trimmed, and then hauled to the railroad by donkey engines, where they are loaded on the cars and taken to the mills. After the logs are sawed they are shipped to the northern and foreign markets, principally by water, from the coast ports of Mobile, Pensacola, Savannah, Charleston, and Norfolk. A small town in Mississippi by the name of Gulfport is one of the greatest lumber shipping ports of the world. Railroads haul large shipments to the northern cities.



(Photo by E. J. Davison, Courtesy U. S. Forest Service)

FIG. 103. LONGLEAF YELLOW PINE, LOUISIANA

This southern district is one of the largest producers of soft woods in the world at present, but so rapidly is the cutting proceeding that the supply of lumber is bound to decrease. Intelligent methods of reforestation will do much to save this district supply because the trees grow rapidly; but at the present rate of consumption and lack of foresight in replanting, the leadership in lumbering will soon pass to the Pacific Coast district.

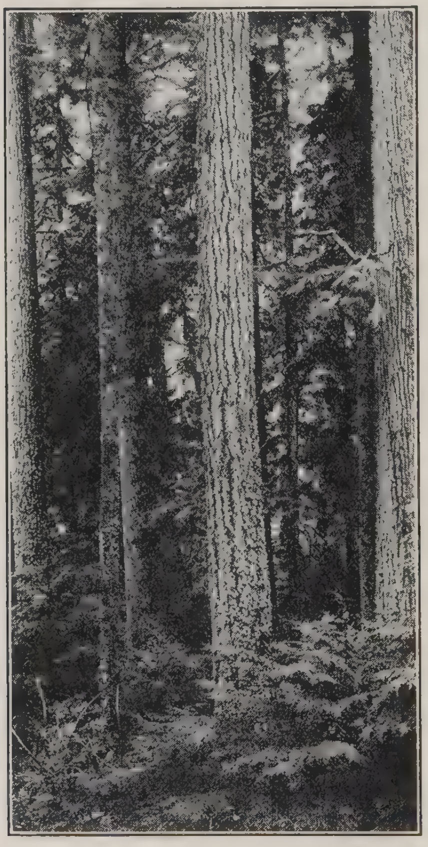
Another wood of importance that comes from this district is cypress, which was formerly used only for cisterns and tanks, but is now finding favor in interior finish work. It grows well in swampy lands. Cedar is found in some places, especially in Florida. Gum wood is also frequently used for interior finish work.

The Hardwood District. As the pioneers pressed westward down the Ohio and Mississippi Rivers, they found extensive forests of hardwoods extending from the Appalachian Mountains westward to beyond the Mississippi River. This belt goes southward to Louisiana and northward to the Great Lakes. This region has been cut heavily to make room for agriculture, some of the excellent hardwood, now so valuable, being burned up.

Because of the abundance of hardwood, factories for the production of farm implements and wagons located here. The furniture industry, centered in Grand Rapids, takes enormous amounts from this district. The demand for hardwood in the automobile industry also draws on this area. The principal centers and markets are Chattanooga, Evansville, and Memphis, the last being the largest hardwood market in the world.

Rocky Mountain District. Forests are found in the higher slopes of the Rocky Mountains, but in rather scattered locations. The number of trees increases quite markedly in the northern end of the mountains because of more moisture. The trees are mostly pine, spruce, cedar, and Douglas fir. As it is difficult to get the logs to the mills, little lumbering has as yet been done. In this area, fires have ruined large tracts of excellent trees.

The Pacific District. Beginning in California and running northward to Washington, this district has the greatest supply of good lumber left in the world. The climatic conditions in this district are such that trees grow rapidly, and reach a great age and size. The rainfall is sufficient, and the dry air prevents fungus diseases. The giant trees of California are thousands of years old, and when sawed, make excellent lumber.

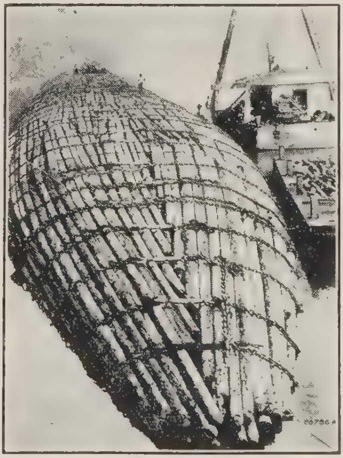


(Photo by A. Gaskill, Courtesy U. S. Forest Service)

FIG. 104. RED FIR WITH HEMLOCK UNDERGROWTH, WASHINGTON

To the north, the redwoods and Douglas firs make the finest boards in the world. The logging situation is difficult and transporting the logs to the saw mills often calls for an immense amount of engineering and planning. Sometimes these huge trees are cut into logs and dragged out by animal power, sometimes pulled along by portable engines, and sometimes carried down a huge lumber chute. One such chute is sixty miles long. When these chutes are built as flumes, water is turned into them and the logs are floated down the flumes. Oftentimes it is necessary to blast the logs into smaller bits so that they can be taken to the mills. Sometimes, on the northern rivers, large rafts, fastened together with immense chains, are made in the form of a huge boat. These rafts are towed down the coast to the mills at San Francisco.

The saw mills in this region are the last word in the matter of system and equipment, and turn out huge quantities of Douglas fir and redwood. This district is the coming lumber district, not only of our country but of the world. Even now the East is using the lumber from this district, which is shipped overland or through the Panama Canal. Great quantities go all over the world, especially to Japan and China, from Seattle, Tacoma, and San Francisco.



(Courtesy U. S. Forest Service)

FIG. 105. TRANSPORTING LOGS IN A RAFT ON THE COLUMBIA RIVER

Deforestation. In this country, we have been extremely wasteful of our wood supply, in marked contrast to the European nations, especially Russia, who carefully conserve their lumber resources. In early times, our forests were a check on agricultural expansion and it was necessary to cut and burn large areas for farms. This gave an attitude of wastefulness from which we have not recovered.

The principal ways in which we waste our wood supply are: (1) unnecessary use of good wood for fuel purposes; (2) tremendous forest fires, many of which could be prevented by proper means of protection; (3) wasteful logging methods and careless tree slaughter; (4) valuable trees used only for naval stores production; (5) killing thousands of trees for their bark for tanning; (6) injurious tree pests; and (7) non-use of saw mill refuse. The results of this wasteful deforestation are: (1) growing scarcity of lumber and approaching exhaustion; (2) soil erosion; (3) floods; (4) wind and sand storms; (5) snow and land slides; and (6) scarcity of fur-bearing animals.

The lumber interests are now realizing more and more the need of eliminating these wastes and conserving the future supply. The government is guarding our national forests with an eye for the future. Scientific forestry is being practised, not only in government forests but in privately owned ones. The states are encouraging tree planting. There is a growing sentiment against needless waste and towards intelligent conservation in this country. Europe has had strict forestry laws for a long time in order to save what she can of her trees. As our great forest areas approach depletion, we, too, are beginning to awaken to the need of replanting and careful scientific methods of conservation.

TEXT QUESTIONS

1. Prove the importance of wood.
2. Classify the various woods. List each class.
3. Give the characteristics of hard and soft woods.
4. Describe the principal soft woods and give their uses.
5. Describe the principal hard woods and give their uses.
6. Describe the principal tropical woods and give their uses.
7. Discuss the geography of lumbering in general.
8. What countries lead in lumbering? Why?
9. Explain the lumber situation in Europe.
10. Where do we export our soft woods to? Our hard woods?
11. Of what do our imports consist? Why?
12. Explain our low percent of exports and imports compared with our production.
13. Name and locate the forest regions of the United States.
14. Trace the leadership in these districts.
15. Describe lumbering in the northeastern section.
16. Describe conditions in the Great Lakes region.
17. Describe lumbering conditions in the South.
18. Describe lumbering conditions in the Pacific Coast region.
19. Contrast the methods of the various sections and give reasons for the difference.
20. Name the ways in which the wood supply is wasted.
21. Give the results of deforestation.

SECTION 2—PAPER

History of Paper Making. Prehistoric man cut crude pictures and figures on rocks. The ancient peoples made hieroglyphics on damp clay, which they then baked for permanency, and thus left us many records. Early in history, man found a way of preparing sheepskin so that it was white and smooth, and wrote his messages on this. Down through the centuries this was called parchment and it has been one of the leading materials for writing, even today being used for college diplomas. On the banks of the River Nile, the Egyptian people found a plant growing, which was called papyrus, from which they made a paper of the same name. This was a favorite material for writing and many of our ancient manuscripts were written on it. The sacred writings, including many books of the Bible, were inscribed on it, generally in the form of long rolls.

The Chinese were the first to make paper from vegetable fibers, using the paper mulberry tree leaves for this purpose. Evidently the Arabs learned this process from the Chinese, because the Crusaders found them making paper from cotton fibers, and brought back to western Europe with them the secrets of paper making. During the medieval times, paper was made by hand from flax and rags, and our first books, printed on this early paper, show that it was crude, poor stuff.

With the invention of printing, the demand for paper naturally grew, and with the increased output, came better grades of paper. Rags were the chief source of paper material until 1875 when an Englishman invented a way of making paper from a grass, called esparto, and this became a very important source of paper stock. Soon after, it was discovered that wood pulp would make paper, and this source has outstripped all others, especially for the poorer grades of paper. Wood pulp now forms over 90% of our paper supply.

Paper Fibers. Today paper is made from many different vegetable fibers which are rich in cellulose, and this results in the many grades of paper in demand for the thousands of uses to which paper is put. Paper is made from rags, principally linen and cotton; wood pulp, from twenty different kinds of trees, such as spruce and poplar; esparto grass; corn husks; cereal straws, especially rye, wheat, and rice; fiber grasses, such as hemp and jute; bamboo trees; and paper mulberry trees.

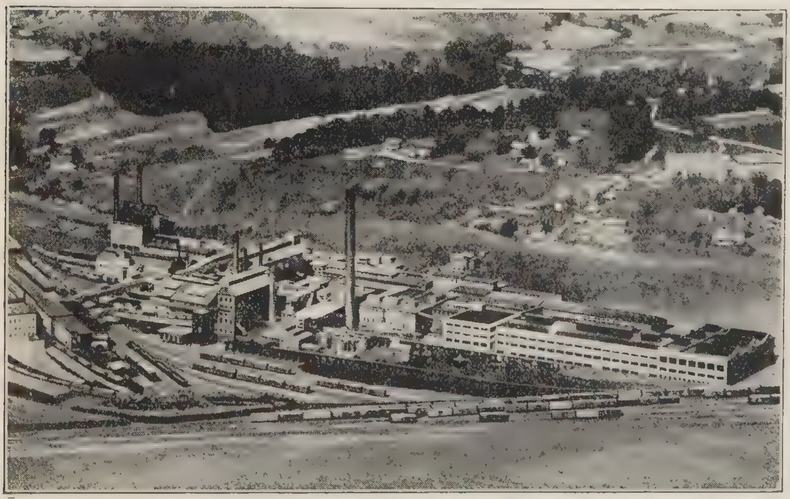
Each one of these fibers has some distinctive characteristic which fits it for a special kind of paper. Linen rags make our finest bank notes, paper money, bonds, and high-grade record papers. Cotton fibers are mixed with linen in making some of the best commercial papers. The best grades of wood pulp enter into the making of high-grade papers, especially of book and magazine papers, where it is oftentimes combined with rag pulp.

The cheaper grades of paper, used in newspaper printing, are all made from wood pulp. The poorer grades of wrapping papers are made from wood pulp and some of the grass fibers. The heavier papers used in cartons are often made from the cereal straws. The Oriental lanterns and beautiful papers of the Orient are made from the inner bark of the mulberry tree. Rice paper is made from a small plant found in eastern Asia and not from rice straw. Esparto grass makes fine printing paper.

Rag Pulp. In collecting rags, the junk man carefully sorts out the cotton and linen rags, which he sells to the paper mills. New rags come from the clothing factories and textile mills. Upon arrival at the mill, the rags are placed in a machine called a thrasher, which whips and beats them to remove dirt and dust, which is sucked out by a vacuum system. They are then sorted, and women remove all bits of metal such as eyelets, buckles, and buttons, and cut the rags into small pieces about four inches square. The rags are then carried to the duster, which again beats them to remove any loose dirt remaining.

The rags are next dumped into a huge boiler, called the "bleach boiler," which slowly rotates and thoroughly mixes and washes the rags in a solution of caustic soda under steam pressure. This cleans the rags and partially bleaches them. They are then passed on to a "washer" which washes them and bleaches them completely, so that they come out pure white. After this the rags are put into the "drainers," which draw off the surplus water and stop the bleaching.

The next machine into which the rags are put is the "beater," which beats and mixes the rags and reduces them to a milky white solution full of tiny fibers. From this machine the pulp is run into the "stuff chest," where a slowly revolving paddle keeps the pulp in motion. The stuff chest is large enough to be a reservoir of rag pulp and feeds it into the paper making machine as needed.

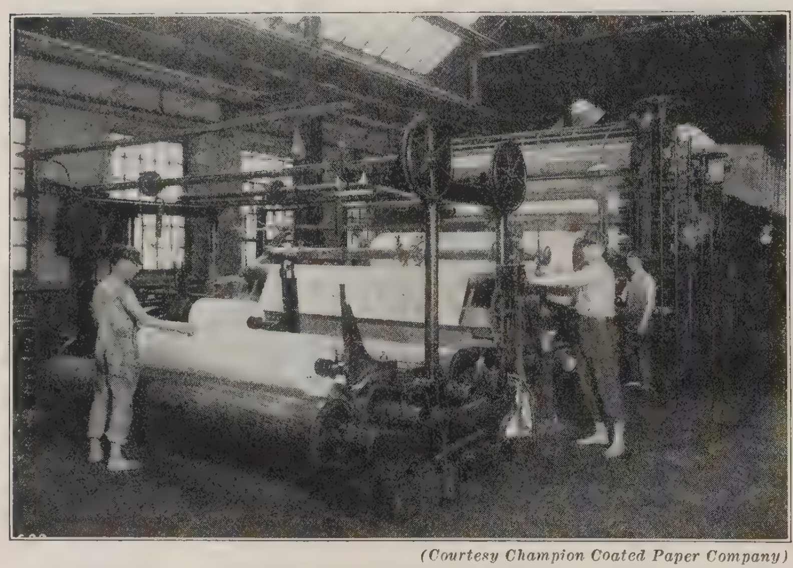


(Courtesy Champion Coated Paper Company)

FIG. 106. WOOD PULP MILL, CANTON, NORTH CAROLINA

Wood Pulp. Logs are prepared for the pulping process by being cut into two-foot lengths, having the bark cut off and knots cut down. The pulp wood is reduced to pulp in two general ways, the mechanical process and the chemical process. In the mechanical process, the prepared pulp wood is fed into machines where it is ground down to fine powder by large grindstones, revolving swiftly in water. So great is the friction of this grinding that cold water must be continually fed to prevent too great a heat. The dust from the ground wood runs into a huge tank, from which it is taken out in layers and pressed to extract the water. This results in pulp sheets, which are shipped to the paper mill.

In the chemical process the pulp is chipped into small pieces by machinery and placed in large tanks where chemicals literally chew up the wood into fine particles. The chemicals are extracted and we have the pulp drawn off again in large sheets for the paper mill.



(Courtesy Champion Coated Paper Company)

FIG. 107. PAPER MACHINE

Paper pulp in this condition resembles large sheets of coarse strawboard. This pulp is again dissolved at the paper mill, and when in solution, is ready for the paper making machine. While in solution it is held in large tanks, called "stuff chests," the same as rag pulp.

Paper Making. Paper making is done wholly by machinery. A Frenchman by the name of Fourdrinier invented a wonderful machine which does the whole process from beginning to end. Some of these huge machines are three hundred feet long. The pulp, which has been mixed from wood pulp, rag pulp, or other materials, is now ready to begin its journey from the stuff chest to the finished product. It is spread evenly over a moving screen belt by a device which is filled from the stuff chest.

The speed of the moving screen belt is carefully adjusted so that the milky stream of pulp is spread on it to the right thickness. A side-ways and up-and-down motion are given to the belt as it moves along, to more evenly distribute the pulp. The water runs down through the holes in the screen belt so that the pulp becomes drier as it moves along.

A roll called the "dandy roll" squeezes some of the water from the pulp and also imparts an impression of a water mark if desired, as in the finer grades. Beyond this roller, there is a suction box which sucks out more water from the drying pulp. The pulp now passes through the first felt-covered rollers which gradually dry it and press it.

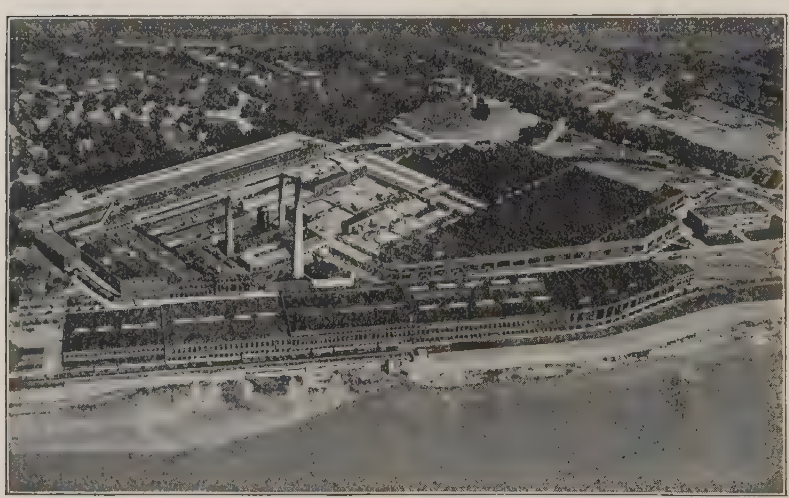
Sometimes a solution called "sizing" has been mixed with the pulp before it begins its trip. In the finer grades a sizing is given to the paper, while on its journey, by passing it through a tub of sizing made up of glue, rosin, talc, and china clay. This fills all the tiny spaces between the fibers and makes the paper smooth and capable of taking ink. When a polish is desired it is passed through polished rollers slightly heated.

At the end of the rolls, the paper is wound on large spools, after which it is cut into strips by being passed between circular knives. Another knife cuts it into sheets from the strip.

If the paper is intended for newspaper print it is left on the large spools and taken to the presses in this form. The cheaper grade paper is dried artificially by heated rollers along toward the end of the paper making machine. The better grade of paper is slowly dried in lofts by air currents.

Location of the Paper Industry. When rags were the main source of paper making materials, the mills were located where there was good water power, and near the markets for rags and paper. As the wood pulp became more and more important, we find the mills shifting to points where, in addition to a good water power supply, there also was a good wood supply, the market factor becoming less and less important as the transportation of pulp and paper became more economical than that of the wood from which they are made.

The result is that much of our wood pulp is now manufactured near the wood supply, oftentimes being made into paper there, though more often shipped in large sheets of wood pulp to the paper factories nearer skilled labor and the markets.



(Courtesy Champion Coated Paper Company)

FIG. 108. PAPER MILL

So great is our demand for wood pulp that our own resources supply only about one-half of our necessities. We import great quantities of wood for pulp and pulp wood itself from Canada, Norway and Sweden. From Europe we import millions of pounds of rags and also some of the finest grades of paper.

Our domestic supply comes mostly from New England, New York, Michigan, Wisconsin, and Minnesota, where there is a good combination of spruce and poplar wood (the best for pulp), water power, and markets. Millinocket and Rumford Falls, Maine, are centers of wood pulp manufacture. Holyoke, Massachusetts, leads in paper manufacturing.

We export but a small percentage of our production, using almost all of it to print newspapers, books, and magazines.

Effect of Paper Manufacturing on Our Wood Supply. At the beginning of our wood pulp industry, great waste occurred, but now our mills are carefully guarding their supply, because they foresee a shortage unless scientific methods are employed. The building and maintaining of large pulp mills require an immense amount of capital.

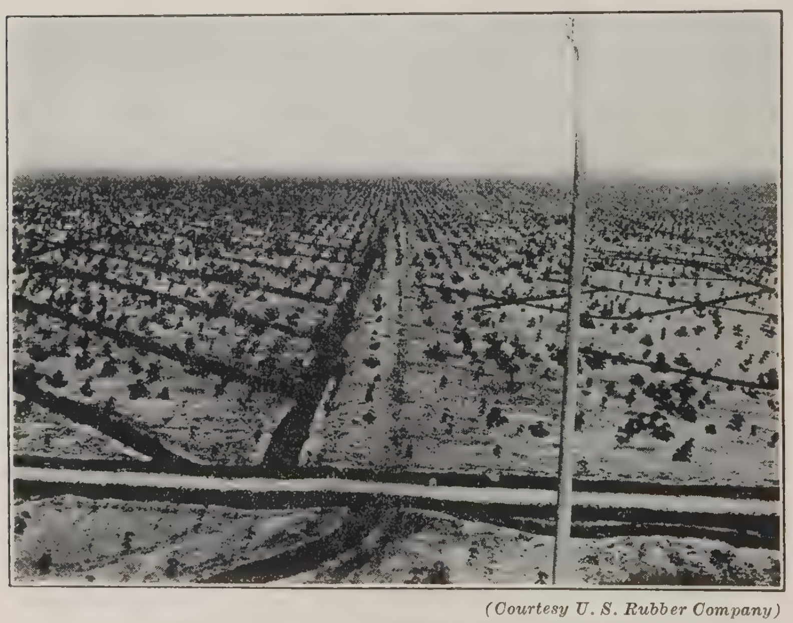
The town of Millinocket in Maine represents an investment running to over $25,000,000 in mills. These mills require a tremendous amount of pulp wood to keep them running, and the owners naturally must secure this supply permanently or lose their capital invested. Thousands of acres in northern Maine are owned by one company. This great area is carefully protected from destructive fires and wasteful cutting so that the supply of pulp wood will be steady and continuous.

TEXT QUESTIONS

1. What substances were used for paper in early times?
2. Who discovered the art of making paper from fibers?
3. Who brought this knowledge to Europe?
4. Explain the rapid improvements in paper making.
5. From what fibers is paper now made? Give characteristics of each kind.
6. Describe the making of paper pulp from rags.
7. Describe the two ways in which wood pulp is prepared.
8. Describe how paper is made from pulp.
9. Where is the wood pulp industry located? Paper industry? Why?
10. Discuss the geography of the wood pulp supply.
11. What is the effect of paper making on our wood supply?

SECTION 3—RUBBER

History of Rubber. Although Columbus found some of the natives playing a game with balls made of rubber, not much attention was paid to this new product until the latter part of the eighteenth century, when crude shoes began to be introduced into Europe. About this time the discovery was made that rubber would erase pencil marks. The product then received its English name of India rubber, a material from the Indies that would rub out marks.



(Courtesy U. S. Rubber Company)

FIG. 109. RUBBER PLANTATION, SUMATRA

In the early part of the nineteenth century, a Scotchman by the name of MacIntosh discovered that rubber could be dissolved in coal naphtha. He used this discovery to impregnate textiles and thus gave rise to the making of rubber coats which for a long time were called macintoshes. Unfortunately the rubber became sticky in hot weather and stiff in cold weather.

It was not until the winter of 1839-40 that a man by the name of Goodyear discovered the process of mixing, under heat, sulphur and other chemicals with rubber to which process he gave the name of vulcanizing. This process made rubber products that were not affected by heat or cold, and also made possible the using of rubber in the various forms now called hard rubber. The use of rubber then began to be of more commercial importance and we find a growing demand for rubber goods.

In 1875 an Englishman by the name of Wickman smuggled some rubber tree seeds out of Brazil and from these seeds have come the great rubber plantations of the East Indies, India, and the Malay coast. Brazil has lost her lead in rubber production to these eastern plantations, but has gained a corresponding lead in coffee production from them. It is fortunate that these rubber plantations were planted at this time, as the bicycle and later the automobile have created a demand for rubber which could not have been supplied in any other way.

The Rubber Tree. Rubber is a hardened juice, called latex, which is extracted from over three hundred kinds of trees, although only a few of these lend themselves well to commercial production. The latex is a white, milky fluid, found just inside the bark, and is not the real sap of the tree. The Hevea tree is the principal source of our best rubber, called Para rubber because it was shipped in large quantities from Para, located at the mouth of the Amazon River, the native home of this tree. It is this tree that is grown so extensively on the plantations of the Far East. It grows rapidly and will yield latex in about five years.

Most of the rubber from Mexico and Central America comes from the Castilla tree. In the Province of Ceara grows a tree called the Manihot which does well on poor soil and with a small amount of moisture. It matures quickly. Its quality of rubber and its yielding period are inferior to the Hevea. Lagos silk rubber comes from Africa.

A vine-like climber in Africa called Landolphia yields rubber also. In Assam in India we find the Assam rubber tree, a member of the fig family, which is peculiar in that it lets down shoots from its branches which enter the ground and form trunks of new trees. In northern Mexico and southern United States a bush by the name of Guayule is receiving much attention. This bush when cut and treated chemically or by mechanical devices yields a rubber.

Various grades are recognized in the crude rubber trade, due to the kind of tree from which the rubber comes, the region of its origin, and the method of curing. Plantation rubber now forms over ninety percent of the world supply and brings a much higher price than the dirtier and poorly cured wild rubber.

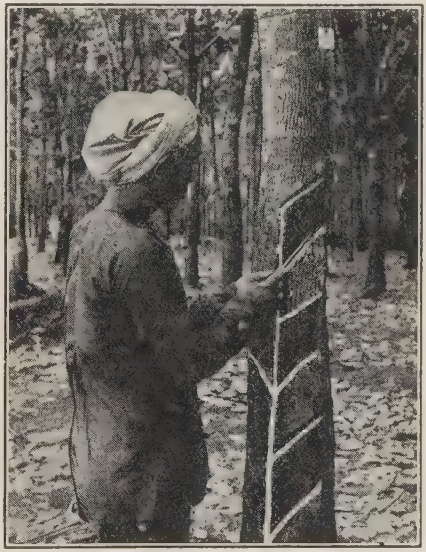
Location of the Crude Rubber Production. Until quite recent years, Brazil was the chief rubber producing country, but the great bulk of the world rubber supply now comes from the large plantations of the Straits Settlements, Ceylon, India, the East Indies, Borneo, and the Malay Peninsula. The control of rubber production is almost wholly in the hands of the British and Dutch at present.

Rubber trees require a temperature between eighty and ninety-five degrees and never lower than seventy-five degrees. From eighty to one hundred inches of rainfall is necessary. The natural home of rubber trees is within thirty degrees north or south of the equator, and the greatest production is found within ten degrees of the equator in a belt about five hundred miles wide.

The Amazon River Valley affords an ideal climate for rubber trees but a very unhealthy one for human beings. For this reason no commercial plantations are found in this region, the production depending wholly on the tapping of the wild trees by natives. In Africa we find wild rubber harvesting by natives an important industry especially along the West Coast region, and along the Congo River.

Some plantation rubber is cultivated in Mexico and Central America, and there is some rubber gathered from wild trees. Large rubber plantations are now being developed in Liberia, in Africa, under American capital.

So varied are the sources of rubber and so increasing is the demand for it that this industry will undoubtedly find many changes in its geography for some years to come. Already it has passed from the wild rubber stage into the planted tree stage. As improvement in the different trees advances, new areas will be opened up and older regions lose their leadership. So important to the world is rubber that no one region will be permitted to monopolize its production long.


(Keystone View Company, Inc., N. Y.)
FIG. 110. TAPPING A RUBBER TREE

Methods of Crude Rubber Production. In gathering wild rubber, the native laborer taps the tree with a long handled axe, or knife, so that the latex runs out from the cuts into little cups, which he later empties into a bucket. The milky latex is then coagulated or hardened by smoke from a fire made of bark or nuts rich in creosote. The native dips a wooden paddle into the latex and holds it over the smoke, which hardens it. This process is repeated until he has built up a large lump, which is called a "biscuit," and weights from fifteen to thirty pounds. The paddle is removed and the biscuit is ready for market.

On the large commercial plantations the trees are set out in rows, from nurseries, and carefully tended until they reach the age of yielding latex, generally in about the fifth year. Several methods are used in tapping the bark. Sometimes the bark is cut in the form of a "V" with the cup at the bottom. Some cut a spiral around the tree. Some cut a long vertical gash, and then smaller ones at an angle of forty-five degrees which feed into the vertical one.

A popular way of tapping is to cut a spiral half way around the tree and each day a new cut is made slightly below the old one. So skillful are the laborers that these cuts form only a small fraction of an inch. The cut must penetrate the bark, but not the tree, as this would injure the tree and also permit the sap to mix with the latex, resulting in inferior rubber.

The latex is gathered from the cups by buckets and carried to the coagulation house where it is strained and placed in large shallow tanks. Acid is thrown into the latex which coagulates it. The rubber is pressed into large sheets and dried. Sometimes it is also smoked and again pressed, leaving diamond impressions, which expose a larger surface to the air. Because of the great care used and the scientific methods employed plantation rubber is free from impurities and dirt which characterize the wild rubber curing.

The plantation rubber is pressed into bales weighing from one hundred and fifty to two hundred pounds, is covered with cloth, and is shipped to market. The great rubber markets of the world are Singapore, Para, London, and New York. Some rubber is shipped to the factory in liquid state, the latex being pumped into tank steamers.

Rubber Manufacture. The great variety of manufactured goods requires many processes in the factory and the description of these must be limited to those which are used to prepare the rubber for the detailed processes. The crude rubber upon arrival at the mill is cut open and inspected for foreign substances. It is then cracked and ground up into small pieces and washed by running water until clean. It is then rolled into sheets and dried thoroughly.

After this it is mixed with various chemicals, the ingredients of the mixture depending upon the article to be manufactured. Soft rubber goods, requiring elasticity, use but a small proportion of these, while hard rubber goods take as high as one-third of the total amount. Sulphur, litarge, and whiting are the principal materials used. After mixing, the rubber is handled in various ways, the processes from this point changing with the nature of the finished article.

Consumption of Rubber. The United States is the largest consumer of rubber products, taking over three-quarters of the world supply. Over 80% of the rubber is used to make automobile tires. Much is used in belting, hose, steam and machine packing, and footwear including boots, rubbers, heels and soles. The electrical industry, including the radio demands, draws on rubber for insulation material and storage batteries. The value of our rubber products runs into millions of dollars annually.

TEXT QUESTIONS

1. Explain the origin of the word "rubber."
2. What inventors improved the making of rubber goods, and how did their inventions help?
3. How did Wickman aid the rubber industry?
4. What is rubber? Latex?
5. Describe the different rubber trees that enter into commercial production.
6. How is rubber graded? What is the best?
7. Why do the English now control the rubber production?
8. Why is the Amazon River Valley an ideal location for rubber? Why is it not developed more?
9. Name and locate the principal rubber regions of the world.
10. How does the United States rank as a rubber producer? Why?
11. What factors affect the geography of rubber production?
12. Can rubber production be monopolized? Why?
13. Describe the various ways in which rubber is produced.
14. Give the different ways in which a tree is tapped.
15. Contrast the primitive and plantation ways of coagulating the latex.
16. How is crude rubber prepared for manufacturing into finished articles?
17. Discuss the consumption of rubber at present.

SECTION 4—MISCELLANEOUS FOREST PRODUCTS

Naval Stores. Tar, pitch, turpentine, and rosin, all products of the pine tree, are called naval stores because of their use aboard ships. Their importance has declined with the displacement of wooden ships by those of steel.

(Photo by E. S. Shipp, Courtesy U. S. Forest Service)

FIG. 111. TURPENTINING

Tar is obtained by distilling the pine wood itself by means of a slow fire in an earthen pit. As the sap is loosened it runs out through holes and is baled up and placed in barrels where, upon cooling, it becomes tar.

Turpentine is made by collecting the sap of the pine tree, in a manner similar to collecting maple sap, and distilling this sap. The sap is put into large boilers or retorts and heated. The vapor passing off is collected and cooled and is turpentine oil. Rosin is the solid material remaining and pitch is the heavy, sticky liquid left. Tar is used to weatherproof ropes, roofs, and boat hulls; also in medicines, and in road making. Turpentine is used extensively as a solvent for paints and varnishes. Rosin is used in soaps and also in paper as a sizing agent. Pitch is used in caulking ships.

Former methods in the naval stores industry were extremely wasteful, resulting in the killing of many valuable trees for their sap only. Present day methods seek to conserve the trees and delay their destruction. The southeastern section of the United States produces over ninety percent of the world supply, exporting much from the ports of the Carolinas and Georgia. France and Russia produce most of the remaining world supply.

Gums. True gum forms mucilage when mixed with water, but is insoluble in alcohol or turpentine. Gums are used for stiffening textile fabrics, in printing calico, in printers' ink, in candy, in medicine, in cordials, and in making mucilage. Practically all our commercial gums are the hardened juice of some kind of acacia tree. Gum Arabic comes from Asia Minor, Gum Senegal comes from northwestern Africa, Cape Gum from southern Africa, and Wattle Gum from Australia.

Resins. True resin is soluble in alcohol and turpentine, but not in water. The hard resins are used for varnishes, after being melted and dissolved in spirits. Zanzibar copal comes from Mozambique and is the hardened juice of a living tree found there. Kauri Copal comes from New Zealand and is the fossilized gum of a tree. Amber is also the fossilized sap of a tree and is found along the shores of the Baltic Sea. This is used in pipe making and also for ornaments such as necklaces and beads. Other hard resins come principally from southern Asia and nearby islands and are chiefly hardened juices of trees.

Among the principal hard resins are shellac, mastic, gamoge, and gum Dammar, the latter not a true gum but receiving its trade name as such.

Oleo resins are viscous liquid resins such as turpentine, lacquer, Peru balsam, and Canada balsam. They are used in paints and varnishes and the balsams are found in medicines.

Gum resins are both gums and resins and find a use in medicines, perfumes, and incense. They almost all come from the tropics. They are aloes, myrrh, frankincense, asafoetida, and benzoin.

Dyestuffs. Formerly vegetable dyes occupied a much more important place in commerce and industry, but modern science has given us mineral dyes, principally from coal tar, which surpass them in cheapness, brilliancy, and permanency. There are some industries which still cling to the use of vegetable dyes, especially in the Oriental countries. The Oriental rug industry depends upon them for its dyes.

Indigo comes from India, Java, and Natal. It is the product of a bush that is broken up, soaked in water and allowed to ferment, whereupon it gradually drops a blue powder which is the indigo of commerce. This dye is extensively used in the Orient for the dyeing of the cheap cotton fabrics of the poor. We use it also as a dye and as a bluing in our laundries.

There are several woods that give us dyes when chopped up and soaked for their juice and sap. Logwood and Brazil wood, trees that grow well in tropical America and the West Indies, are the principal sources of dyes. Red is the principal color extracted from them, although black is obtained also.

Madder comes from the ground-up roots of a plant and yields various colors—pink, red, purple, and black, depending upon the original root and the method of preparing.

Fustic gives us a yellow dye and is extracted from the wood of a tree that does well in the East and West Indies.

Tanning Materials. To change hides into leather, solutions rich in tannin are required. For centuries the vegetable kingdom has supplied the materials for tanning. The principal source of these materials has been found in the barks of certain trees, the hemlock, the oak, the larches, the willow, the quebracho, the wattle, and the birch.

Other sources of tannin are the acorn cups from the

Valonia oak in Asia Minor and the Balkan peninsula; divi-divi, which is the dried pods from a tree that grows in tropical America, the East Indies, southern Asia, and Australia; leaves of the sumac tree which grows in America and in Sicily; dried fruits of a tree that grows in southern Asia called myrobalans; and the root of a plant found in southern United States and northern Mexico called canaigre.

Tanning material in the form of oak and hemlock bark was plentiful in colonial times and small tanneries abounded everywhere. As the supply of tanning material became more difficult to get, it was found advisable to centralize this industry into larger plants, to extract the tannin from its sources and to ship it in highly concentrated form to the tanneries. This concentration permitted the use of various woods which could be made into extracts.

Our present supply of tanning materials comes from the Appalachian district; from the northern forests from Maine to Wisconsin; and from certain trees in our Pacific District. Tanning extracts now come from the various regions of the world best adapted to their production. In the past the tanning material industry has been one of great waste, millions of good lumber trees having been sacrificed for their bark alone. Present day methods seek to combine the lumbering industry and the bark industry to the advantage of both.

Oils. Oils of vegetable origin may be classified into two groups—fixed oils and volatile oils. The fixed oils do not evaporate upon exposure to the air and will saponify. They are generally secured by mechanical means, especially by pressure, from the wood, the seeds, the fruit, and the leaves of trees and shrubs. Some are drying oils like linseed oil, and some are non-drying oils like olive oil.

Fixed oils are used in paints, varnishes, cooking, soap making, medicines, lubrication, illumination, and for table use. Among the principal fixed oils are olive oil, cotton seed oil, corn oil, linseed oil, cocoanut oil, cocoa butter, castor oil, peanut oil, almond oil, and palm oil.

Volatile oils are sometimes called essential oils because they are essences extracted from their various sources by distillation. They evaporate quickly and will not saponify. They are used in perfumery, flavoring, medicines, and paints. Their sources are flowers, fruits, spices, and saps. Turpentine and camphor are classified as volatile oils.

Nuts. Nuts as a food supply enter into commerce to the value of several million dollars annually. Among the commercial nuts we find coconuts, walnuts, almonds, chestnuts, acorns, pecans, Brazil nuts, peanuts, hickory nuts, filberts, and hazelnuts. Coconuts form the principal item of import into this country as we have no available areas suitable for large cultivation.

Almonds, filberts, and Persian (English) walnuts form a leading part in our nut import, although our domestic production is increasing. The chestnut forms a very important place in the food supply of southern France and the Latin countries. We import millions of pounds of peanuts from the Orient where their production is cheap.

TEXT QUESTIONS

1. What are naval stores and why so called?
2. How is tar obtained? Turpentine? Rosin?
3. Why have naval stores resulted in much waste of wood?
4. For what are some of the by-products used?
5. Where are naval stores produced?
6. Name the principal tanning materials. Where does each come from?
7. Explain how extracts are now made near the source of supply.
8. Show how the securing of tanning materials resulted in waste.
9. What are gums? Where obtained? What used for?
10. What are resins? Where obtained? What used for?
11. What are gum-resins? What used for? Where obtained?
12. What has displaced vegetable dyes in importance?
13. Where are vegetable dyes still used? Why?

14. What is indigo? How produced? Where produced?
15. Name some of the principal vegetable dyes and tell where they come from.
16. What are fixed oils? Name some. What used for?
17. What are volatile oils? Name some. What used for?
18. Name some principal nuts. Where grown? How used?

PROBLEMS AND PROJECTS

1. Which is the best material to build a house of—stone, brick, cement, wood? Give reasons for your answer.
2. Make a list of all the uses to which wood is put that you know about.
3. Make a list of the substitutes now being used for wood and explain how they are used.
4. What help does your state give to encourage the planting of trees?
5. Mention ways in which many forest fires are started. How can the number of these be lessened?
6. Make a list of the various kinds of wood that you can find in your house—including the furniture. Where does each kind come from?
7. By asking people who know, find out how much common lumber has risen in price in your community in the last twenty-five years.
8. Draw an outline map and locate the principal lumber regions of the world. Of the United States.
9. If you were going into the lumber business in what section would you locate? Why?
10. If you were going into the making of furniture where would you locate? Why?
11. How have the forests helped us? Hindered us?
12. Explain why the prairies are treeless.
13. Make a collection of pictures showing lumbering and milling.
14. Make a collection of pictures showing wasteful methods in lumbering.

15. Explain why it is cheaper sometimes to import paper pulp. Where does it come from? Why?
16. Make a list of common articles made from paper.
17. Get samples of various grades of paper and compare them. What makes the difference in quality?
18. What efforts are American manufacturers making now to grow their own supply of rubber?
19. Why do not the large concerns in the United States make large rubber plantations in the Philippines?
20. If you were going to go into the growing of rubber where would you locate? Why?
21. What is synthetic rubber? What is it used for?
22. On an outline map of the world indicate the principal regions of rubber production.
23. Show how science has found a way to reduce the waste formerly occurring in the tanning industries.
24. Make a list of the principal tanning materials now used and tell where each comes from.
25. Show how mineral dyes are displacing vegetable dyes.

TOPICS

1. Forest control in Europe and in America.
2. The work of our government in forest preservation.
3. The future of lumber in our country.
4. Modern plantation methods of growing rubber.
5. The English control of the rubber market.
6. Nuts as foods.
7. Creosote as a wood preservative.
8. Composition shingles.

FOR CLASS DISCUSSION

1. Greater governmental control of our wood supply is justifiable.
2. In the use of our forests we owe a debt to the future.
3. To protect its supply of rubber, the United States would be justified in acquiring regions where it can be grown.

CHAPTER XVI

VEGETABLE FIBERS

SECTION 1—COTTON

History of Cotton. The growing of cotton started in India, far back in history. We know that cotton fibers had reached a high degree of perfection in that country by 600 B.C. when Hindu priests used it as an emblem of holiness. Nearchus, admiral of Alexander the Great in his expedition to India in 330 B.C., relates, "There are in India trees bearing, as it were, great bunches of wool from which the natives make garments whiter than any other."

Cotton was also known to the ancient Egyptians. Its cultivation slowly spread into northern Africa and in the year 1000 A.D. we find the Moors bringing it into Spain. The Romans used some cotton. Caesar's tent was made of it, and a cotton awning was used in the Coliseum. For centuries, India was the source of cotton cloth. The extraction of the seeds made it very costly and its use was greatly restricted. Calico gets its name from Calicut in India.

Cotton was in use in the Americas long before Columbus sailed from Spain. Cortez describes its use in Mexico and Magellan found it in Brazil. The Peruvians used it for centuries before the advent of the Spaniards.

Up to the invention of the cotton gin in 1794, the production of cotton was limited to countries like India, because of the great amount of cheap labor needed to extract the seeds. This invention changed the cotton industry and shifted it to the industrial countries where machinery displaced hand labor. From that date on, cotton became the leading world textile for clothing. This change in the textile industry had a great influence on the world's commerce and industry, coming as it did at almost the same time as the invention of steam power.

Kinds of Cotton. Sea island cotton is grown along the sea coast of the Carolinas, Georgia, and Florida. It gets its name from its location. It has the longest fiber of any cotton plant, about two and one-half inches long. Its fibers are very fine and are used for high-grade cotton goods such as laces, gauze, muslins, and imitation silk. Its seeds are easily separated from the fiber. This fiber is much prized in the making of automobile tires.

Egyptian cotton has long fibers averaging about one and one-half inches long. In the United States this fiber ranks next to sea island in value. This kind of cotton has been planted in Arizona and California where it does well. The color varies from brownish yellow to white. It is used much in underwear, hosiery, and automobile tires.

(Courtesy U. S. Department of Agriculture)

FIG. 112. COTTON BOLLS

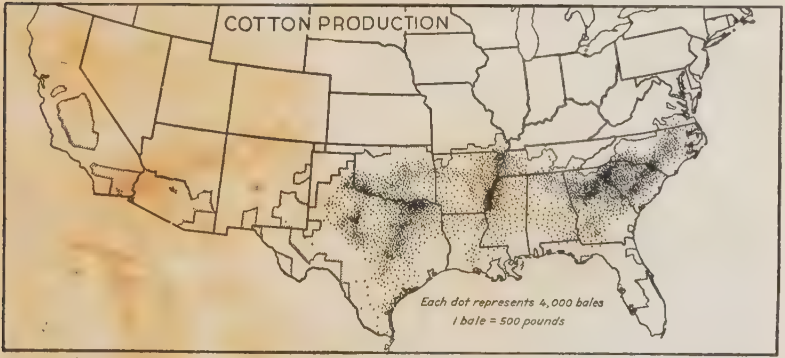
American upland cotton furnishes most of our raw cotton supply. Its fibers average about three-fourths to one inch in length. It is hard to separate from the seed. Texas leads in the growing of this kind.

Indian cotton is short fibered and grows on trees. We use but little of it in this country. Peruvian cotton is very coarse, rough, and hairy, and has a reddish color. It is chiefly used to mix with wool.

The Geography of Cotton. The United States generally produces from one-half to three-fifths of the world's supply of cotton, and is therefore a very important factor in cotton production. India produces about one-fifth, followed by China and Egypt. The rest of the cotton is grown in Asiatic Russia, Brazil, Peru, Mexico and Persia.

The exporting countries of raw cotton are the United States, which sends about one-half of its crop abroad, Egypt, Peru, and sometimes India. Brazil, Russia, China and India use most of their crop for domestic use. Most of our exports of raw cotton go to England, Germany, France, Japan, and Italy. Exports to the first three nations are declining while exports to the last two are increasing.

The countries which lead in cotton manufacturing are the United States, England, Germany, France, India, Russia, Italy, China, and Japan. The principal export markets for American cotton piece goods are the Latin American countries, the Philippine Islands, and Canada. This commerce with India and Japan is declining because of the increase of manufacturing in these countries. We import some of the best grades of raw cotton from Egypt and the finer grades of piece goods from England and Europe. England contributes 64% and the United States 6% of the world export of manufactured cotton.



(Courtesy U. S. Department of Agriculture)

FIG. 113. COTTON PRODUCTION

The Cotton Plant. Cotton will grow 40 degrees north or 40 degrees south of the equator, but thrives best within 35 degrees of it. It is a plant which grows year after year, but is generally planted every year or every two years. In the United States it is planted every year, and grows to a height of from two to four feet.

In South America and India it is not planted annually, but allowed to grow year after year, where it resembles a small tree and grows from fifteen to twenty feet high. The cotton plant varies owing to different factors such as the nature of the locality where it is grown, methods of cultivation, choice of seed, soil, climate, and nearness to the ocean. The fiber comes from pods which burst open and disclose a boll of cotton full of seeds.

Conditions of Growth. Cotton thrives best in a warm, damp atmosphere with plenty of rainfall. It requires a light, sandy soil, which keeps damp and yet holds the heat. It reaches its highest quality in a moist, even climate with warm summers, salt in the air, and in the soil. Rain in the early growing season is helpful but later when the crop is ripening it is apt to be harmful. The cotton plant is very sensitive to frost.

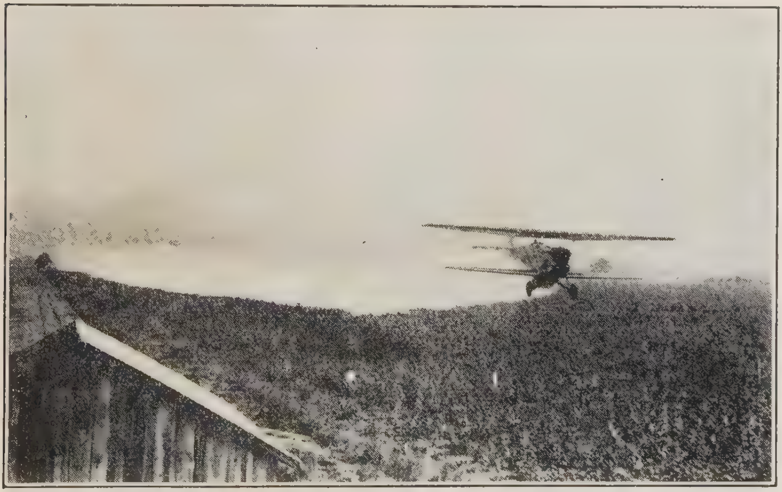
(Keystone View Company, Inc., N. Y.)

FIG. 114. A COTTON FIELD

Conditions in our southern states are very favorable especially because of the gradual rise in temperature during the season when the cotton is growing. In Brazil excessive heat makes the cotton rough and coarse. Egypt, because of its warm climate and ample irrigation, is favorable to cotton growing. In India the excessive heat, followed by the monsoon summer with no sun, prevents the crop from maturing well, and the result is an inferior and short staple fiber.

Planting of Cotton. The ground is carefully prepared, after which the seeds are sown in rows about four feet apart. This planting is done in March in the United States. After the seeds have sprouted, the "chopping out" is done. The surplus plants are cut with a hoe, leaving the other plants, which are to mature, a short distance apart. This is an expensive process, as it is done by hand.

Fear of frost and the constant fight against the boll weevil keep the cotton growers worried. Their worst enemy is the boll weevil which is an insect which attacks the cotton boll and destroys the inside fiber before it is ripe. This insect originally came from Mexico and has spread all over the cotton area of the South, despite the fact that the Department of Agriculture has kept up a constant warfare upon it. Long winters and poison help destroy this pest.



(Keystone View Company, Inc., N. Y.)

FIG. 115. AEROPLANE USING POISONED DUST TO KILL COTTON BOLL WEEVIL

Aeroplanes are now being used to aid other machines to spread poison dust over the cotton fields to kill the weevil. The use of the aeroplane gives promise of eventually conquering this evil, because it can dust large areas in a comparatively short time and so stop the boll weevil from injuring the cotton before he has a chance to start.

Cotton Picking. The crop begins to mature late in July, and continues to do so until November or December. Just as soon as the bolls begin to open and show ripe cotton, the picking begins. There are usually three pickings. The lower bolls open first. The lower and middle bolls on the plants produce the best fiber. Cotton picking time in the

South is a trying time for the employer of labor, as there is usually a rush to the cotton fields when the crop is ready. The laborers are paid according to their ability to pick, generally at a fixed rate per hundred pounds, and it is possible for the average picker to pick over 200 pounds a day. Experts can pick twice as much.

The cotton crop, despite the invention of many machines, is still picked by hand. The machines, while they are almost human in some respects, do not choose between bolls and leaves, and cannot select the ripe bolls from the unripe. Recent invention has brought out a machine which works on the vacuum system and men holding the vacuum hose in their hands can quickly suck off the bolls as they wish. This saves much time and promises to become practical in operation. Picking is a large item in the cost of cotton growing, especially of low price cotton.

Ginning Cotton. The object of this process is to remove the fiber from the seeds, to which it clings. Each cotton ball contains about forty or fifty seeds, which are hidden among the fibers. The first gin for cleaning cotton was called a Churka and was used in India.

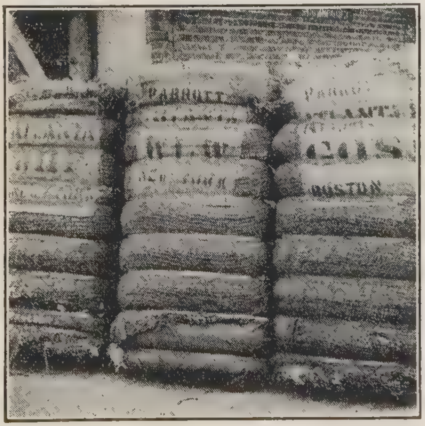
In 1794, Eli Whitney invented the cotton gin. His machine consisted of a drum with wire hooks or teeth, which rotated against a grating on the other side of which was the raw cotton. The teeth caught the fiber and drew it through the bars, leaving the seed to drop to the ground after a brush had taken it away from the drum.

This crude machine has been improved until today it exists under the name of saw gin and is capable of cleaning thousands of pounds a day. While formerly, two men could clean two pounds a day by hand, now two men can unload the cotton from the wagons and attend to six gins, cleaning 24,000 pounds a day.

The saw gin consists of a long box, or chamber, on one side of which is a grate of metal bars. From forty to eighty rapidly revolving notched saws catch the fiber and pull it through the grate, allowing the seed to rattle down a trough. The fibers are removed from the saws by a brush and a current of air. The cotton is sucked from the wagons by air chutes and is ginned and baled within an hour.

The little linters which still stick to the seeds after the first ginning are removed by a second gin. These linters are used for poorer grades of cloth, batting, wadding, and in the making of explosives. The saw gin tears the fibers and damages them in the ginning process. The roller gin is used for ginning sea island and other long fiber cotton. The cotton passes between two rollers where a fixed blade catches the seeds and knocks them off while the fiber is drawn through.

Baling Cotton. The clean cotton represents about one-third of the weight of the unginned cotton, the other two-thirds being the seed. Baling is usually done at the ginnery. The cotton is taken to a large box, the bottom of which is the size of the bale and is compressed into the form of a bale, 54 inches by 45 inches by 27 inches. While the quantity in the American bale varies, it is usually about 500 pounds.



(Courtesy U. S. Department of Agriculture)

FIG. 116. COTTON BALES

If the cotton is destined for export it is rebaled by the Morse lever press. This machine subjects the cotton to terrific pressure which reduces the bale in size, after which it is covered with jute bagging and bound with steel bands. As in the case of many other commodities, the exporters of cotton have been guilty of carelessness in shipping and so have invited the criticism of foreign buyers.

By-Products of Cotton Seed. Cotton seed was formerly considered worthless, but now forms a very valuable part of the cotton crop. It is pressed for its oil, from which many valuable products are obtained such as nitro-cellulose, explosives, celluloid, films, artificial silk, rayon, table oil, soap, candles, cattle food, and fertilizer.

Testing Cotton. The United States Department of Agriculture now puts out standards for the judging of cotton, based upon the length, strength, fineness, smoothness, uniformity, color, cleanliness, and pliability of the fiber.

American cotton in general is white, clean, and has a uniform length of fiber. Sea island cotton from the United States is noted for its length of fiber and its silkiness. New Orleans cotton is noted for the regularity of its fibers.

A buyer of cotton considers the general appearance and feel of the cotton; its cleanliness, that is, its freedom from dirt and leaves; also its strength and resistance, which he tests by pulling the fibers apart with a sudden jerk; and lastly its length of fiber and its uniformity, which he tests by laying several fibers on his coat sleeve and examining their appearance.

Marketing Raw Cotton. In marketing raw cotton, usually anywhere from 5% to 10% is allowed for moisture. Also 5% is allowed for tares covering dirt, etc.

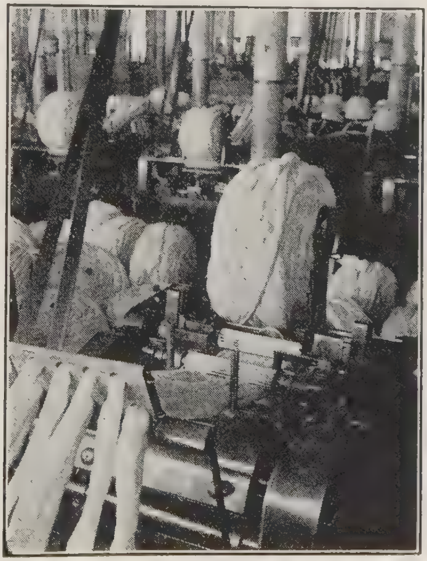
There are nine distinct grades of cotton, varying from the highest called "fair" down through the scale to "ordinary" which is the poorest. The medium grade is called "middling" and is the basis of prices.

The cotton is sold direct to the mills or to dealers. It is often stored and held back for better prices. To aid in the selling of cotton, there are several cotton exchanges where the buyers and sellers meet. The principal markets are located in several southern cities, Memphis, Houston, New Orleans, Savannah, Galveston, and also in New York, Boston, Liverpool, Bremen, and Havre.

Spot sale of cotton means immediate delivery. Future sales means that the cotton will be delivered at some future time. Cotton from different countries comes into the market at different times in the year—American at one time, Egyptian at another, while cotton from Brazil and India is shipped all the year round.

The Manufacture of Cotton. The general process of manufacturing cotton may be divided into three divisions: cleaning and combing the fibers; pulling and twisting the fibers into threads; and weaving the thread into cloth.

When the bales arrive at the mill, they are cut open; then the cotton is loosened and fluffed up and cleaned by a series of machines. The fibers then pass in the form of a large roll "lap" where they are carded and cleaned by rollers with tiny teeth, which brush and comb the fibers parallel and into a thin sheet. This sheet is then gathered into a loose cotton rope about an inch thick called a sliver. A number of slivers are combed and drawn out, being united into one draw sliver. The slivers then pass through a process called "roving" which further draws and slightly twists several draw slivers into a coarse yarn.



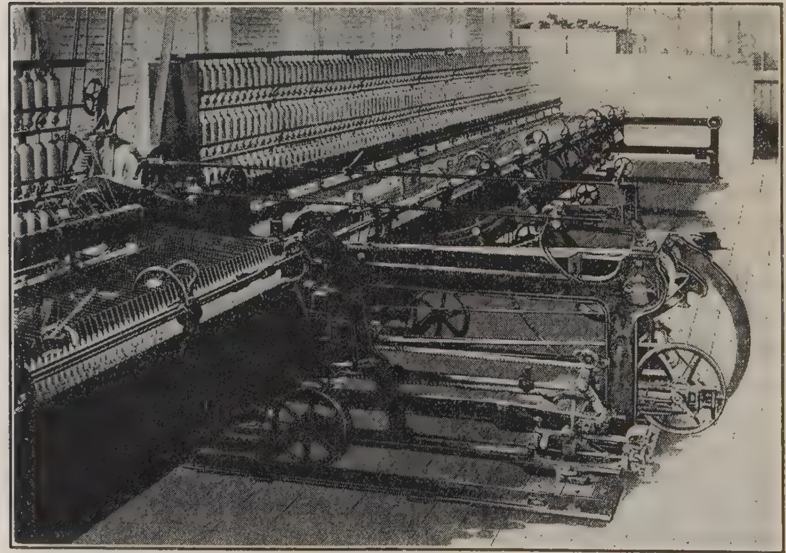
(Keystone View Company, Inc., Meadville, Pa.)

FIG. 117. DRAWING FRAMES IN A COTTON MILL

The cotton is now ready to be spun into thread by a spinning machine. Two methods are used to spin cotton thread, the ring spinner which is more common, and the mule spinner. In the first machine, the cotton is twisted and drawn by a rapidly revolving device. In the second, the cotton is twisted rapidly and at the same time drawn out by a frame which moves away from the revolving spindle.

After spinning, the thread is drawn off onto spools in a process called "winding" to get greater length. At this stage, sometimes the thread is shrunk and strengthened by immersion in proper solutions. Thread may also be dyed if dyed threads are desired in the weaving process.

From the spools, the thread is drawn onto immense spools, called "beams," in such a way that there are hundreds of parallel threads wound around the beam. These threads will later compose the warp of the cloth, or the long lengthwise threads. Other threads, called "filling threads," used to form cross threads, are wound onto bobbins.



(Courtesy U. S. Department of Agriculture)

FIG. 118. MULE SPINNING FRAME

The warp threads from the beam are now drawn through devices called harnesses, so arranged that some lengthwise threads may be raised and others lowered, as desired. Weaving consists of raising and lowering certain lengthwise threads and causing a shuttle full of thread, which unwinds as it goes, to cross between them in the open space between the higher and lower threads. The machine that does the weaving is called a "loom."

After the cloth has been woven it is bleached pure white by chemical processes, or dyed, and sometimes printed by huge color presses which stamp each color separately. It is then starched or sized, smoothed, pressed, and wound in large rolls ready for the market.

England has held a front rank in cotton manufacturing since the advent of machinery. The European wars gave it a good start about the year 1800. The coal and iron, near at hand in England, produce the machinery and power; the climate is ideal for spinning, being of the right degree of dampness; and the people are mechanically minded. Furthermore, because of her economic conditions England must manufacture to support herself, and textiles lend themselves particularly well to her purpose.

In the United States, the eastern states, especially New England and the middle Atlantic states, early started in the manufacturing of cotton goods. Here also the presence of power, water power at first and later coal power, coupled with the unfitness of the land for general agriculture, was a factor which made manufacturing profitable. The climate also was favorable, and the population, chiefly of English stock, followed the example of the mother country. New England secured the lead and has held it despite growing competition.

More recently, cotton manufacturing has become established in the southern states, where conditions are favorable. The labor situation in the South is favorable to the manufacture of low-grade cotton goods such as sheeting, webbing and the cheap grade cloths. As yet the more skilled labor of the North has retained the leadership in the finer grades of cotton piece goods.

It seems evident at present that cotton manufacture will remain along the coastal states of the Atlantic because it is well established there, skilled labor has settled there and does not wish to move, and transportation of raw materials is cheaper by water. The great markets are located there also and the ocean is the highway for exports to foreign markets. It appears to be cheaper to bring the raw cotton to the centers of dense population, where a steady supply of labor for manufacturing is available and a near market at hand.

TEXT QUESTIONS

1. Discuss the history of cotton growing up to 1800.
2. What two discoveries in the eighteenth century greatly increased cotton production? Why?
3. Describe the principal kinds of cotton.
4. What are the principal cotton producing countries? Which export? Why the difference?
5. What are the leading manufacturing countries? Why?
6. What countries import cotton goods from the United States? Why?
7. Why does England export so large a percentage of cotton goods? Why is our percentage so low?
8. Describe the cotton plant.
9. What conditions are favorable to cotton growing? Contrast differences in the various cotton growing countries.
10. How is cotton planted in the United States? How is the boll weevil fought?
11. Why is cotton picking a large item in the expense of its cultivation? Are machines practicable? Why?
12. Describe the cotton gin and tell how it works.
13. Discuss the baling of cotton.
14. What do we get from cotton seeds as by-products?
15. How is cotton tested? How is cotton sold?
16. Discuss fully the methods used in manufacturing cotton thread.
17. How is cotton woven into cloth?
18. Why does England occupy such an important place in cotton manufacturing?
19. What factors encouraged early manufacturing in New England?
20. What factors are favorable for manufacturing in the South? In New England?

SECTION 2—FLAX

History of Flax. The use of flax extends far back into prehistoric times, linen cloth forming a part of the clothing of the ancient Swiss Lake Dwellers. Linen was used to wrap the Egyptian mummies in, and samples of linen taken from these tombs have been washed and found still to retain their strength. The peoples of ancient times in Mesopotamia, Greece, and Rome knew and used linen much for clothing. Frequent reference to linen is made throughout the Bible, showing that it was in common use from early Biblical times.

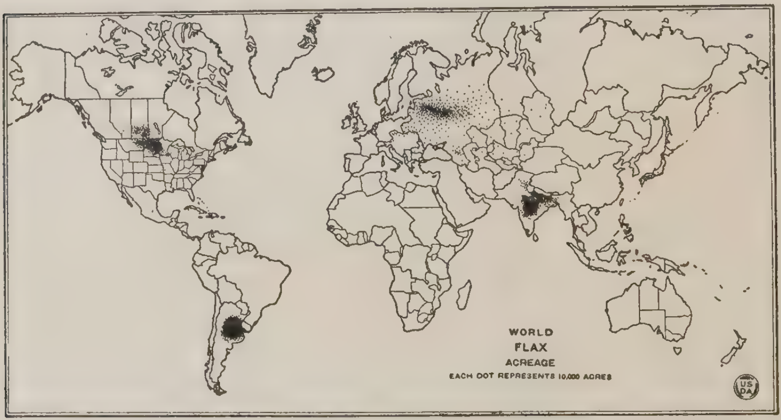
Down through the centuries, linen has been the principal cloth in use by civilized peoples and held first place until the cotton gin so cheapened cotton cloth as to give it the great lead it now has. Even now, linen is held in high esteem for certain uses, such as table linen, napkins, collars, shirts, and surgical appliances.

Because of its great tensile quality it is a favorite in the manufacture of twines and ropes which require great strength. The invention of the detachable collar created a big demand for linen because of its peculiar adaptability to this purpose. In colonial times in this country, linen occupied a very important place in clothing; flax was grown throughout all the colonies and spun at home for the finer grades of shirts, dresses, and clothing in general. When mixed with woolen fibers it formed the linsey wool of colonial fame.

After the end of the nineteenth century the general use of linen declined and cotton became the popular material for clothing because of its cheapness and superior advantage for clothing in general. Flax spinning and linen manufacturing gradually gave place to the cotton mills until today the United States makes only the cheaper grades of linen and twines.

The Geography of Flax. In discussing the geography of flax cultivation, distinction must be made between flax growing for seed and flax growing for fiber. When grown for fiber, flax must be harvested before the seeds are ripe in order to conserve the toughness of the fiber. When grown for seed, the fiber is worthless and is generally burned.

Countries which grow flax for its fiber are countries with a large supply of cheap, hand labor which is necessary for its successful cultivation. As flax grows well under conditions favorable to wheat, we find it cultivated in similar regions. Russia has led all other countries in flax fiber cultivation, producing as high as four-fifths of the world supply. We find also that flax is grown for its fiber in central Europe, Belgium, Holland, France, and the British Isles, principally in Ireland. In all these countries there is an abundance of cheap labor and whole families are available for the necessary hand work.



(Courtesy U. S. Department of Agriculture)

FIG. 119. WORLD FLAX ACREAGE

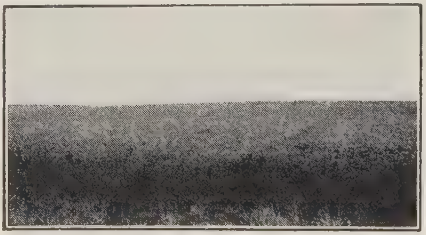
Flax is grown for its seeds in Argentina, India, central Russia, and the United States. From the seeds is extracted the linseed oil so necessary in paints. The manufacture of the fiber into linen cloth is centered around western Europe in Belgium, France, Holland, England, and Ireland, where skilled workmen are found to make the flax into the wonderful, fine linens which we import. As has been stated, we manufacture but little linen, and that is confined principally to collars, shirts, toweling, and cordage.

The leading cities in the linen industry are: Brussels, excelling especially in fine linen laces; and Belfast, Ireland, which excels in napery of all kinds.

Preparation of Flax. When cultivated for its seeds only, flax is planted, reaped, and threshed by the same methods as wheat, the seeds subsequently being pressed in a manner similar to cotton seed for oil.

When planted for its fiber, flax requires much care. Hand weeding is necessary when the plants are small.

When the stalk begins to become yellow at the base, the time has arrived to harvest it. The flax plants are pulled up by the roots, the dirt shaken off, and then the flax is tied into small bundles. These are piled into stacks to dry. The seed is separated from the stalk by drawing through spikes. This is called "rippling."



(Courtesy U. S. Department of Agriculture)

FIG. 120. FIELD OF STANDING FLAX

Next comes the retting process, which consists of placing the stalks in large bundles under water until the vegetable matter between the fibers and the outside woody bark, is rotted sufficiently to be separated. Care must be used not to ret, or rot, the flax too much as this would injure and weaken the fibers themselves.

Sometimes dew-retting is practiced by leaving the flax in the fields and letting the rain and dew rot it. In Ireland, the flax is retted in shallow ponds. In Belgium, in the Coutrai district, the flax is placed in large wooden tanks and sunk below the surface of small rivers. The River Lys is famous for its retting qualities because of the chemical make-up of the water which rets the flax quickly and well.

The flax is left in the water from four to twenty days, depending upon the water and the condition of the flax. After retting the flax is dried again. Sometimes, after drying, it is again retted two or three times.

When properly retted and dried the flax is then scutched. This process consists of pounding the fibers free. This may be done by hand but is generally done at a special mill where a machine made of revolving paddles strikes the fibers rapidly and so loosens and pounds out the undesirable foreign matter.

After the scutching the fibers are hackeled by drawing them over spikes which still further extract any matter from the fibers and leave them straight and clean. In this process the tow or short flax fibers are combed out to be spun separately from the longer flax fibers which average about twelve to eighteen inches long.

The fibers are now ready for spinning. Dampness is essential in the spinning because of the brittleness of the flax. Sometimes the fibers are passed through hot water baths before spinning and sometimes the first spinning is done under water.

Other than this requirement, the general method of spinning flax is similar to that of cotton and the methods of weaving, bleaching, and dyeing also resemble those of cotton. Bleaching of fine linens is oftentimes done by exposing them to the dew and sunshine, but where speed is desired resort is made to chemical solutions.

TEXT QUESTIONS

1. Prove that linen was well known in ancient times.
2. What is linen now used for? Why?
3. Why has linen declined as a material for clothing?
4. Where is flax raised for fiber? For seed? Why?
5. Where is linen manufacturing located? Why?
6. Describe the growing of flax for fibers.
7. How is it reaped?
8. Describe the various processes necessary to convert flax into linen thread.
9. How is linen thread made up into cloth? Bleached?
10. What makes linen so costly? What invention would change this?

SECTION 3—MISCELLANEOUS VEGETABLE FIBERS

Minor Vegetable Fibers. Vegetable fibers may be classified into two general kinds, bast fibers and structural fibers. The bast fibers are those taken from the stem or stalk of the plant like flax, jute, true hemp, or ramie. Structural fibers are those found in the leaves, leaf stalks or stems, or in fruits, like manilla hemp, sisal hemp, pineapple fiber, and coir. Bast fibers are generally extracted by rotting, the same way as those of flax. Structural fibers, like those of sisal hemp, are generally extracted by scraping.

Jute. Jute is a bast fiber that is grown extensively in India and to some extent in China and Formosa. It is the poorest of our fibers and is used where cheapness rather than strength is desired. The plant grows to a height of about fourteen feet. It is cut by hand and then treated almost like flax. The fiber resulting is long and soft but has little strength. It colors easily but does not hold the color well. It is used only in the poorer grades of textiles, like bagging, burlap, upholstery, carpets and rugs, linoleums, covers for cotton bales, and the cheaper grades of twine and rope.

India is the largest producer of jute and exports it to the countries requiring bagging for grains and cotton bales.

Hemp. True hemp is a bast fiber resembling flax. It was well known to the ancient peoples and ranked as an important textile next to flax, until the coming of cheap cotton. The plant grows from three to ten feet high. The extraction of the fiber is accomplished by practically the same methods as those used with flax. Dew retting is a common practice, especially in the United States. True hemp grows well in the temperate zone where there is sufficient rain and a three-months' growing period free from frost. Russia is the greatest producer. Italian hemp is noted for its quality. American hemp is grown principally in Kentucky where it finds a favorable location. The central European countries all produce some hemp.

It is used as a substitute for flax, as in rope, twine, carpet and rug manufacturing, in the manufacture of clothing, for linings, and for twine in the cereal fields. It is also used in the Orient as a narcotic under the name of bhang.

Ramie. Ramie (rhea) and china grass are classed as one in trade, although there is a slight difference in their botany and preparation. Ramie is raised in China, Japan, and India and will do well in a semi-tropical climate. It is a perennial which spreads rapidly and reaches a height of fifteen feet. It is cut by hand.

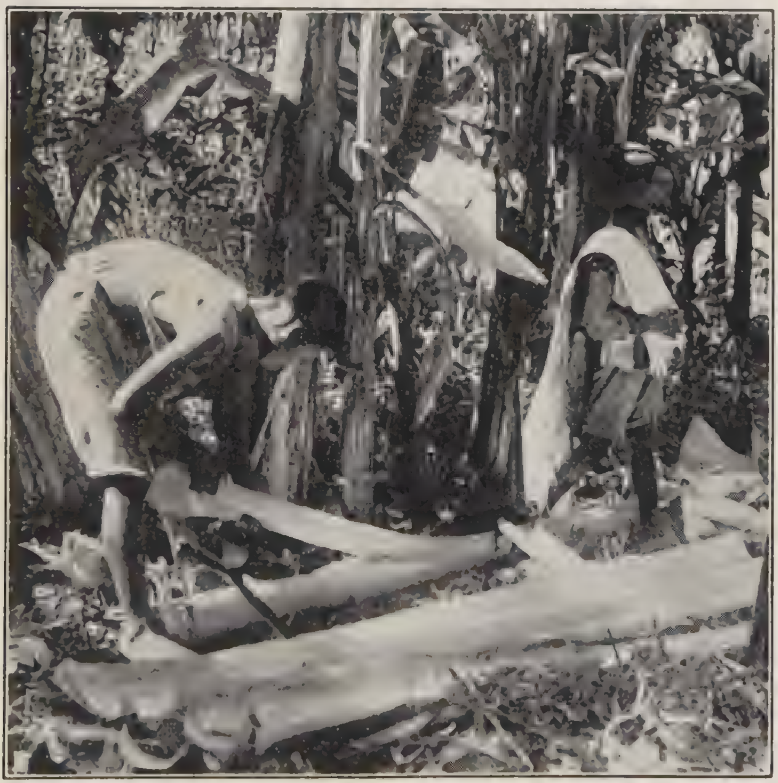
The process of extracting the fibers is a difficult one owing to the fact that they are held together by a gummy substance. This gummy substance is extracted by soaking in water and caustic soda followed by acid solutions. When the fibers are freed of their gum and woody substances, they are fine and silky. This fiber is one whose use is fast increasing, and as the improvement in the process of extraction gains, we shall see this fiber used more and more.

Already we find it used in making lace, upholstery, table ware, toweling, ropes, sails, underwear, and dress goods. It has many of the qualities of linen, is tough yet soft, and wears well when woven into cloth.

The invention of a successful machine for degumming ramie will make ramie a competitor of both flax and cotton. Raw material comes from the Far East and India and is manufactured in France, England, and the United States.

Pina or Pineapple Fiber. The leaves of the pineapple plant are the source of this fiber. The plant thrives well in tropical and semitropical climate and is generally raised for its fruit. The Philippine Islands excel in the extraction of this fiber. The pineapple spine or leaf is cut and the fiber scraped by machines or drawn through knives which separate the vegetable matter from the silky fibers. These are later dried and made into cloth, which is very soft and silky. It finds its way into our stores and is sold as pineapple cloth.

Coir. The outer husk of the coconut is composed of coarse fibers. After the nut is taken from this husk, the husk is allowed to rot in water until the woody substances are soft and easily extracted by pounding and combing. The fibers resulting are short but can be twisted into strong, solid ropes. Coir ropes are used at sea because they float and are affected very little by salt water. Some of the coir is made into coarse mats, especially door mats. Some is used to stuff upholstering and for packing.



(Keystone View Company, Inc., N. Y.)

FIG. 121. GATHERING MANILA HEMP, PHILIPPINE ISLANDS

Manila Hemp. Manila hemp, or abaca, comes principally from the Philippines where the specie of non-fruiting banana trees, from which it is taken, thrives well. The leaf stalks around the central stalk are used for the fiber. They are cut into strips, scraped by machines or knives to remove the pulp, dried, and are then ready for use.

Manila hemp is used principally in making twine and rope. Much is used on our western farms as binder twine for grain. Europe also takes a large amount for rope and twine. The fiber is sometimes used in making cloth, especially the softer and finer fibers. Old rope, made of this fiber, is the principal source of cheap manila paper.

Sisal Hemp. Sisal hemp is called henequen. It is a species of agava plant which thrives well in Yucatan in Mexico, which is its native home and from whence the greater part of it comes. This fiber has been known for several hundreds of years and was used by the Spaniards on their ships. The invention of the self-binder-reaper increased the demand for twine, and this resulted in increased attention to this hemp.

The long, spiny leaves are cut and put through a machine which scrapes off the pulp and leaves the fibers which are then dried. The fibers are used for twine, bagging, and cordage. The natives also use it for hammocks and mats. It forms an important item of export for Mexico and is exported principally to the United States and Europe.

Rayon. Within the past few years, there has sprung up an industry in the making of rayon. Although the knowledge of rayon has been in existence for almost a half a century, it was not until after 1912 that the manufacture of it reached important dimensions.

A Frenchman by the name of Chardonet made a study of silk and finally arrived at a process by which a textile, resembling silk, could be made from vegetable substances rich in cellulose. By reducing wood pulp or cotton to a thick viscous condition and then pressing the result through tiny holes, a fragile filament is made. Several of these are twisted together and form the thread of rayon.

Rayon looks and feels like silk and is fast becoming known not only as an artificial silk, but also as a textile in its own right. It is used extensively to weave with other textiles to give them a silk-like finish. It is used also in making underclothes and light weight garments. Since 1925, when our annual output reached about 52,000,000 pounds, the increase in the use of rayon has been phenomenal. The processes of its manufacture are still held more or less a secret and large amounts of capital are required to build and equip the factories for its manufacture. It also requires a high degree of technical knowledge for successful production.

TEXT QUESTIONS

1. What is the difference between bast and structural vegetable fibers? Contrast methods of extracting the fibers.
2. Describe jute and its production.
3. Where is hemp grown? What used for? What is bhang?
4. Discuss ramie and China grass.
5. What is pineapple cloth? How obtained? Where grown?
6. What is coir? How obtained? Where grown? What used for?
7. What is manila hemp? How obtained? Where grown? What used for?
8. What is another name for sisal hemp? Where is sisal hemp grown? What used for? How obtained?
9. What is rayon? How is it made? What is it used for? Discuss its growth in recent years. What is its future? Why has its production been limited to a few concerns?

PROBLEMS AND PROJECTS

1. Collect samples of various grades and kinds of cotton.
2. Plant some cotton seeds and watch the plants grow.
3. Gather the strings and ropes made from vegetable fibers. Which is strongest? Cheapest?
4. Why are Buffalo and Cleveland great paint cities?
5. Where is flax raised in this country for its seed?

6. Make a list of all the by-products from cotton seed. Secure some samples if possible.
7. On a simple hand loom show how weaving is done.
8. Explain how thread is spun on a large scale in factories.
9. Collect pictures showing cotton being grown, picked, ginned, baled, shipped, and manufactured.
10. Make a collection of pictures showing the minor vegetable fibers in all stages.
11. Make an outline map of the world showing regions where the vegetable fibers are grown principally.

TOPICS

1. The clothing of medieval times.
2. Textile machinery inventors.
3. The boll weevil.
4. The effect of cheap string.
5. Ropes and their composition.
6. The future of ramie.
7. The competition among minor vegetable fibers.
8. The negro exodus from the South and its effect on labor supply.
9. Rayon—its history and future.
10. England's interest in the Civil War.
11. England as a textile maker.
12. The competition in cotton manufacturing between the North and the South.

FOR CLASS DISCUSSION

1. Free trade in textiles would be beneficial to the United States.
2. The South will eventually be the center of our textile industry.
3. A child labor amendment to the Constitution should be passed.
4. Diversified crop farming would benefit the South more than one crop, cotton.

CHAPTER XVII

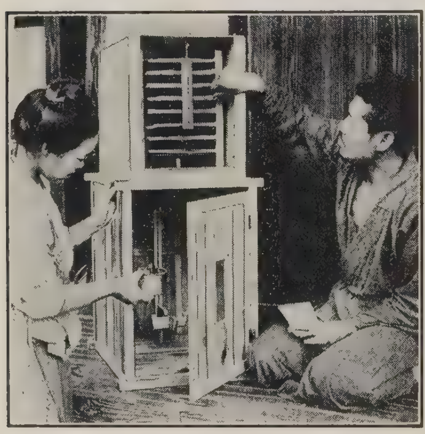
ANIMAL FIBERS

SECTION 1—SILK

History of Silk. Over forty-five hundred years ago, a Chinese queen discovered that the tiny web of the silk worm cocoon could be reeled and made into thread, and then woven into cloth. The Chinese guarded well their secret and succeeded in retaining a monopoly on the silk industry from that time on, for over two thousand years. The people of Japan, India, and Persia finally acquired the secrets of the industry, and the records of the invasions of Alexander the Great in the East brought to Europe its first knowledge of this textile.

It was not until the sixth century, however, that silk culture began in Europe. Up to that time, what silk was found in Europe had been imported from the eastern countries. The silk culture was started in Europe by two Nestorian monks, who brought back with them some silk worm eggs in the hollow of their bamboo staffs. Under their instruction the silk industry soon spread into Greece, Asia Minor, and from there, later, to Italy, Spain, and France, these countries having an ideal climate for both the silk worm and the mulberry tree upon whose leaves the worms feed. Silk culture was practised in the American colonies up to the Revolutionary War which put a stop to it. It did not become important again until about 1830 when a craze for it swept the country, leading to speculation and consequent financial loss. The crash came about 1838 and silk culture has never been revived here.

While climatical conditions are excellent for worms and their food supply, the labor here can not compete with the supply of cheap labor in the Orient and Europe. Europe is now experiencing a decline in silk culture because of the competition of the cheap labor of the Orient. Transportation facilities have increased to a point where the freight charge is relatively low and consequently the cheap labor of China and Japan is crowding the more costly labor of Europe. The raising of silk worms is almost wholly a matter of hand labor.



(Keystone View Company, Inc., N. Y.)
FIG. 122. HATCHING SILK WORMS IN AN INCUBATOR, JAPAN

The Geography of Silk. Raw silk is produced in China, Japan, Italy, France, Spain, India, and Asia Minor. China and Japan are the leading countries, owing primarily to the large amount of cheap hand labor found in them. All of our imports come from these two countries.

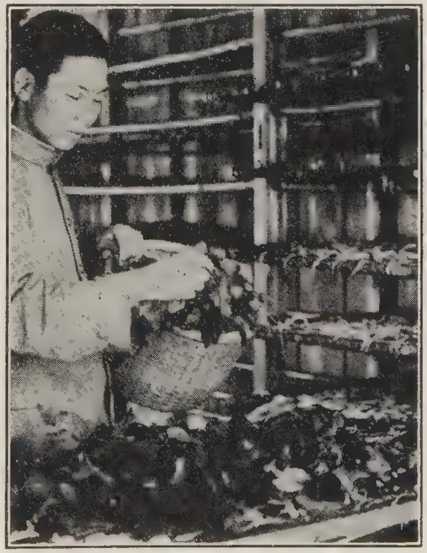
A province of China called Shantung produces our tussah silk, which is the silk from worms fed on a species of oak leaves. The best silk cloth comes from Europe, principally from France, Krefilk in Germany, Milan in Italy, Zurich in Switzerland, and from Paterson, New Jersey.

In the manufacturing of silk, the United States leads all others. Owing to the small percentage of freight in the cost of silk, the manufacturing of silk is confined to the great industrial nations of Europe and the United States, while the production of the raw material is found chiefly in the Orient where cheap labor abounds. In Paterson, New Jersey, an interesting combination of industries is found, the silk industry employing thousands of women and girls and the iron foundries employing hundreds of men.

Silk Culture. The silk worm is hatched from the eggs of a moth called Bombyx Mori. These eggs are laid on prepared paper sheets. The papers are kept in a cool, dry place until the time for hatching arrives, which is the time the mulberry tree leaves are at their best. The eggs are then hatched in incubators.

The silk worm, when it breaks open the small shell, is less than an eighth of an inch long. It crawls up through holes in a screen placed just above the hatching sheet, on which there has been placed bits of mulberry leaf. The worms that are healthy crawl up to their food supply and in so doing scrape off any egg shell that may still adhere to them. The weaker worms can not do this and are taken away with the litter of the hatching sheet.

Great care is exercised to keep the temperature of the room even and warm, with no drafts. The worms are very sensitive to outside influences and will stop eating when anything out of the ordinary routine happens. They require absolute cleanliness, good air, and are very quick to sense perfumes or tobacco smoke. Great loads of mulberry leaves are required to feed the worms which feed mostly at night.



(Keystone View Company, Inc., N. Y.)

FIG. 123. FEEDING MULBERRY LEAVES TO YOUNG SILK WORMS

They grow steadily in size, passing through a molting stage every few days until four stages have been passed. At each molting they stop eating for a day or two while the old skin is being sloughed off. When about a month old they begin to seek a place on which to spin their cocoon. At this time bamboo sticks or tree branches are placed where they can find them.

After finding a good place the silk worm begins to anchor his web and to spin his cocoon. From two holes in the upper lip issue two small webs which unite and are enfolded in a sticky substance from the mouth, forming one tiny strand. This is ejected from the worm by a to-and-fro movement and is formed into loops in a figure eight. The outside of the cocoon is spun first after which the inside is gradually built up. The silk worm itself keeps getting smaller as it makes the silk web to fill the space inside the cocoon.

After about three days the worm has spun his cocoon and has become a larva inside of it. In eighteen days the larva has changed into a moth, which works its way out from the center of the cocoon after first moistening one end of it with saline saliva. This breaks the silk web and spoils the thread, except for poorer grades of silk called spun silk. To prevent this bursting of the cocoon, except in cases where the moth is desired for an egg supply, the larva is killed shortly after the cocoon is completed, by heating the cocoon to a degree that kills the larva but does not injure the silk.

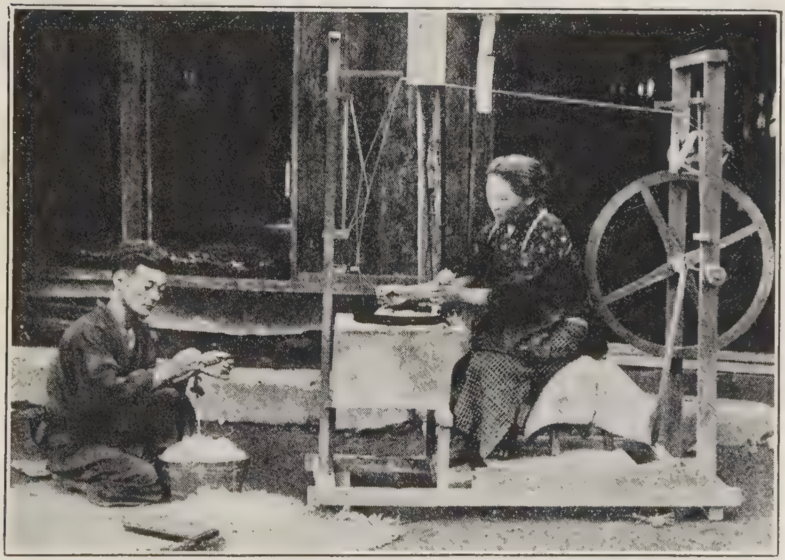
The cocoons are dried and can be kept in this condition for long periods of time. Some cocoons are not heated and the moths are allowed to break out and lay eggs for the future supply of worms. In this case paper is supplied on which the female lays her hundreds of eggs in a small space, after which she dies.

Preparation of Raw Silk. The cocoons are placed in warm water to loosen the outside covering and to make it possible to pick up the end of the filament with the aid of a small brush. The ends of at least five of these filaments are then passed through a small eye, similar to the eye of a needle, where they join into one filament which is wound on a reel. This reeling is done by hand, also by machinery. Great care must be used to keep the combined filament smooth and of even thickness, and to see to it that new filaments from other cocoons are joined when the supply from any cocoon is exhausted.

When there is sufficient silk reeled to make a skein, the skein is taken from the reel and secured to prevent raveling.

In this condition, after drying, it is ready for the market. Several skeins are packed in a "book" and several books baled up together. Around the bale is placed a cloth covering of linen or cotton, which prevents theft in shipment and also keeps the raw silk clean.

In buying raw silk, caution is used to prevent fraud. Silk absorbs much moisture and in order to prevent loading raw silk with a large percentage of moisture before selling, a special procedure is employed. Samples of the raw silk to be bought are taken from the bale and after weighing are thoroughly dried artificially. The loss in weight is noted and upon this basis the price of the silk is based.



(Keystone View Company, Inc., N. Y.)

FIG. 124. REELING SILK IN JAPAN

The silk is first reeled on small reels and then re-reeled into skeins.

The Manufacture of Silk. To prepare the raw silk for weaving and dyeing, it must pass through several processes. This procedure is called "throwing silk" and the men who do it are called "throwsters." The raw silk is first soaked in lukewarm water into which oil and soap have been mixed.

This loosens the natural gumminess of the raw silk. After this bath, the silk is dried by artificial means. It is then wound on bobbins from the skeins. During this process the silk is stretched and smoothed down to a uniform thickness.

Next, several threads from as many bobbins are drawn through an eye into one thread and wound on one bobbin. The next process twists one, two, or three threads together. Sometimes one strand is twisted by itself and then twisted with another strand or perhaps more than one other strand. The number of threads and the number of twists depend upon the specific use to which the thread is to be put.

The thread is then boiled to remove any gumminess that may be present. In this degumming process the silk loses much weight. Care must be taken not to boil it too long. It is at this stage that frequently weighting materials in the form of mineral solutions are added which give weight to the silk but, of course, adulterate it. Pure silk cloth contains no mineral weighting at all and wears longer. The thread is now bleached, dyed, stretched, and lustered by special processes. Sometimes dyeing is postponed until after the thread is woven into cloth.

After these processes the silk thread is again wound on bobbins or spills and is ready for weaving. From this time on the processes of weaving are so complicated that their description belongs to a special discussion in a book on textiles. The various silk cloths are named from their weave, their finish, their patterns, and the raw silk which enters into them.

Other Silks. After the silk filament has been reeled from the cocoon, there remain broken pieces and the outside. When the moth is allowed to mature and emerge from the cocoon it so breaks the filament that it can not be reeled. From these broken and left over pieces comes what is called "spun silk." The broken pieces of filament and cocoons are soaked well in soap and water to loosen the gum of the cocoon and filaments. After washing, the broken pieces are dried. They are then pulled apart and from this waste silk is spun a thread following the general processes of spinning in cotton. This spun silk is used to weave with real silk in cloth, and sometimes is used by itself and the resulting cloth called "spun silk cloth."

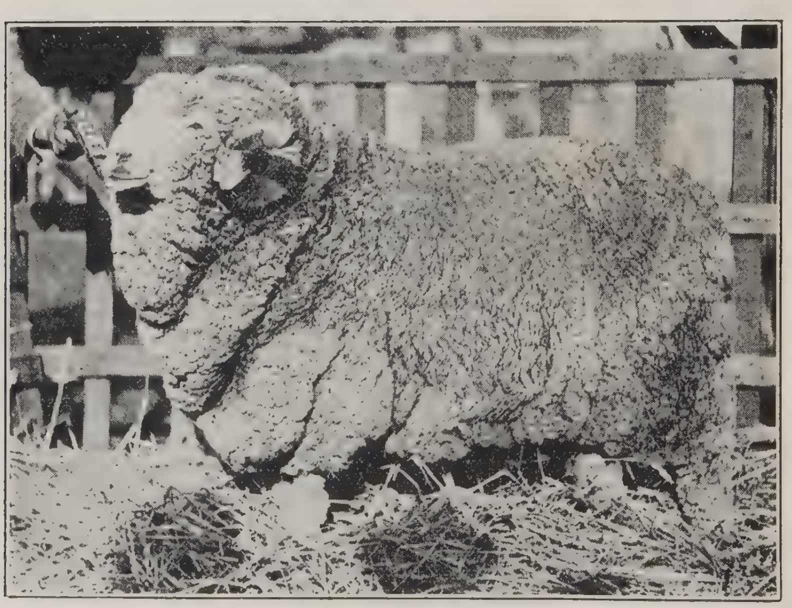
Cotton is made to resemble silk cloth by a process called "mercerizing," which consists of treating the cloth with chemicals which give it a feel and luster similar to silk. Silk gut, used much for leaders on fishing lines, is extracted from the silk worm by a special process which draws out the sack of silk in the worm to a length of three or four feet, thus forming a heavy strong strand.

TEXT QUESTIONS

1. Tell about the origin and history of silk.
2. How did it spread into southern Europe? Why?
3. What has been the history of silk culture in the United States?
4. Why is silk culture not profitable here? Why is it profitable in the Orient and the Mediterranean countries?
5. What regions lead in silk culture? Why?
6. Why do we lead in silk manufacturing? What other countries are important?
7. Name the leading silk cities of the world.
8. What is one reason why the silk manufacturing industry centers at Patterson?
9. Why do some countries produce and other countries manufacture raw silk?
10. Describe fully the raising of silk worms and the making of cocoons.
11. What is done with the cocoons to prevent the moth from spoiling it when it emerges?
12. How is the raw silk reeled and prepared for market?
13. How is raw silk sold? Why?
14. Describe the methods used in silk manufacture.
15. How is silk adulterated?
16. What is spun silk? How prepared?
17. What is mercerizing?
18. What is silk gut? How made? What used for?

SECTION 2—WOOL

History of Wool. Just when man began using wool for making garments, we do not know, but that its use was general from the earliest time is evident from the many records which ancient peoples have left. Even in the earliest chapters, constant mention of sheep is found in the Bible and the founders of the Hebrew race are pictured as leading a pastoral life with their flocks. Egyptian tombs tell us, in pictures, of the importance of sheep and wool in those days. Ancient Greek writings describe the spinning and weaving of wool, and many of the beautiful carvings left by the early Greeks show the importance of wool in their lives.



(Photograph from Wide World Photos)

FIG. 125. THE CHAMPION WOOL BEARER OF AUSTRALIA

As the value of wool grew, efforts to increase the quality of the wool were made, resulting in great improvement in the fleeces of domestic sheep over those of the wild sheep. Records as far back as 200 B.C. tell us of the care with which sheep were bred to increase their wool value. Shortly after the Christian era began, Spain became famous for the quality of the wool obtained from the sheep she raised by intelligent cross-breeding. These sheep were the ancestors of the noted merino sheep, famous for their wool. Later other districts became important in this industry. During the Middle Ages, we find a wool grown in central Europe, called "electoral wool," becoming much sought after.

In England attention has always been paid to sheep raising. Some kinds of sheep have been developed because of their long wool fibers, others for their fine wool, while still others for their mutton. The early colonists in America brought over sheep with them, principally of the merino type, and sheep raising has been important ever since. Australia also was found to be an ideal location for sheep raising and now leads the world in wool production. The merino is the favored breed there.

Changes in Wool Growing. One of the many changes of the last hundred years in sheep raising should be noted. For centuries wool was raised locally in comparatively small flocks and the domestic demand was supplied near home. With the coming of cheap and efficient transportation, we find that sheep raising has become the great industry of the semi-arid borderlands of civilization, where the climatical and pasture conditions are favorable. As the world population has become more and more dense, agriculture has displaced the pastoral life near the large centers of population and has pushed grazing into the lands farther away and as yet unsettled.

While sheep are still raised in agricultural regions, more attention there is being placed on their mutton qualities rather than their wool growing qualities, and we look to the open spaces for our great supply of wool. As these spaces decrease with the onward march of population and agriculture, the wool supply must decrease unless more attention is given to the improvement and increase of the amount of wool per sheep, to keep pace with the declining numbers.

Another factor that also enters into the future wool supply is the demand for mutton, which is naturally opposed to that for wool. Many sheep-raising regions are now turning their attention to increasing the mutton content, where formerly they were interested in the wool supply. South America is gradually changing the breed of her sheep to breeds that are mutton producers rather than wool producers. What is now wanted is a breed of sheep that does equally well as a mutton and wool sheep. This will make it possible to grow both products and sell the more valuable.

The Geography of Wool. In the amount of wool grown, Australia leads the world, followed by the United States and Argentina. Russia has been an important grower and will probably later resume her place near the top. Other leading countries are New Zealand, South Africa, and Uruguay. Over all the world in the temperate zones one will find sheep being raised locally. Much of the wool is also consumed locally. In our country Texas leads, followed by Wyoming and Montana. Ohio grows our finest wool although she ranks only eighth in quantity.

The United States and England compete for leadership in wool manufacturing. At present, we lead. France is also an important manufacturer. Japan is fast coming into an important place as a manufacturer, although she has to import practically all her raw materials. Our domestic supply is equal to only about one-half of the demand of our mills and we import heavily from the wool exporting regions of the world, principally from Australia and South America. Our carpet wool comes from India, China and the Near East.

We import manufactured wool from England in the form of woolens and worsteds, and also from the Near East in the form of rugs and carpets. Recent estimates give the following rank to the continents in volume of wool produced: Australia, Europe, South America, North America, Asia, and Africa.

Kinds of Sheep. As has been mentioned, the merino breed of sheep was developed early in Spain, from whence it was carried to other places and interbred with other kinds, resulting in various subclasses of merino such as the Rambouillet of France. From the merino sheep, we get our finest grade of wool. This class of sheep is a poor mutton producer.

In England, where there has always been a big demand for mutton, certain breeds of sheep have been bred for their mutton qualities. This has resulted in the English long wool sheep such as the Lincoln, Cotswold, Shropshire, Romney and Leicester. Their wool is much longer and lustrous than the merino but much coarser in texture. Another class of sheep in England are called the down wools. These sheep excel in mutton qualities also, but have a finer and shorter wool than the other English breeds. The principal kinds of sheep bred in England are Southdown, Hampshire, and Oxford.

Shepherds in the big sheep-raising regions of the world have crossed the merino sheep with some of the English breeds in an attempt to get a sheep with good fine wool and also with good mutton qualities, but as yet one strain will lead and result in either a good mutton sheep or a good wool sheep. Progress is, however, being made.

The sheep in Asia and Africa, except in South Africa, have not been scientifically bred for either wool or mutton with the result that they produce a very coarse and rough wool which is used in carpet making almost wholly.

Sometimes poor care and breeding result in the decline of wool and the increase of hair on the sheep. In Brazil there are sheep which have no wool and are covered only with hair. These are valuable only for mutton and their skins. In and around Syria there is a type of sheep whose tail is so fat that it is called a "fat-tailed sheep." So fat is its tail that it drags on the ground and amounts sometimes to almost one-third of the entire weight of the animal.

The merino wool is the standard of fineness and all wools are classed by it. So general has become this custom, that wool is graded in the fleece as full blood merino, one-half blood merino, and so on, the fiber being classified as if it came from the various cross bloods of the merino sheep, although the sheep from which the wool came may have no merino blood in them at all.

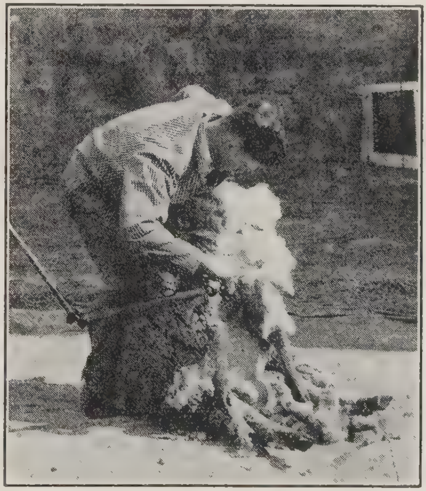
Sheep Raising. As has been mentioned, sheep raising in quantity for wool is now located mostly in the open spaces of the world. Sheep require much pasturage and so are raised where it is cheapest. It is better economy to raise sheep in far lands in sparsely settled areas and to transport the wool clip to the manufacturing centers than to raise the sheep where land is more valuable.

(Courtesy U. S. Department of Agriculture)

FIG. 126. SHEEP IN CALIFORNIA

Australia and New Zealand have an ideal situation for sheep raising. There the grass provides an all-year pasturage and the climate is too dry for successful agriculture. Certain regions in South America, notably in Argentina and Uruguay, lend themselves well to grazing large flocks of sheep. Our western dry-grazing lands, east of the Rocky Mountains, find sheep raising suitable.

The sheep are herded in large flocks from one thousand to two thousand in a flock. One sheep tender is hired to tend the flock and, with his intelligent sheep dogs, can see to it that the sheep are protected from wild beasts, given sufficient water, and led to good pasturage. The life of a shepherd is a lonely one. The owner sends supplies to him every once in a while but between visits he is alone with his sheep.



(Courtesy U. S. Department of Agriculture)
FIG. 127. SHEARING SHEEP

Because the sheep graze the grass so short, they can be fed over pasturage only after intervals of considerable time. The feuds of the cattle and sheep men in the West are well known. The fact that cattle will not follow or feed with sheep because the sheep crop the grass so low, gives rise to the conflicts on the open range between the two kinds of interests. Our sheep in the West are now pastured mostly on the large prairies near water holes, if possible, or in the national reservation under government permits.

Shearing. In most countries, sheep are sheared once a year in the spring. Sometimes before shearing they are sent through a trough full of water and some kind of disinfectant to wash some of the dirt from the wool. More often they are treated this way directly after shearing to kill any insect pests that may bother them. Shearing is done by hand and also by machinery. The latter way is more rapid and is used on the large sheep ranches. The sheep are held while the shears are run over them and the wool clipped close to the skin. The fleece comes off in one piece and is wrapped in one bundle.

In Australia, more attention is given to shearing. The fleece is cut in sections by grades, and those of one kind are all baled together instead of entire fleeces with their various grades being left together.

At the slaughter houses the wool is saved. It is pulled from the skin of the dead animal after the skin has been sweated or chemically treated. This class of wool is called pulled wool and composes about one-sixth of our wool supply in the United States. Pulled wool is generally sent to a special factory, which is located near the slaughter house, for manufacture.

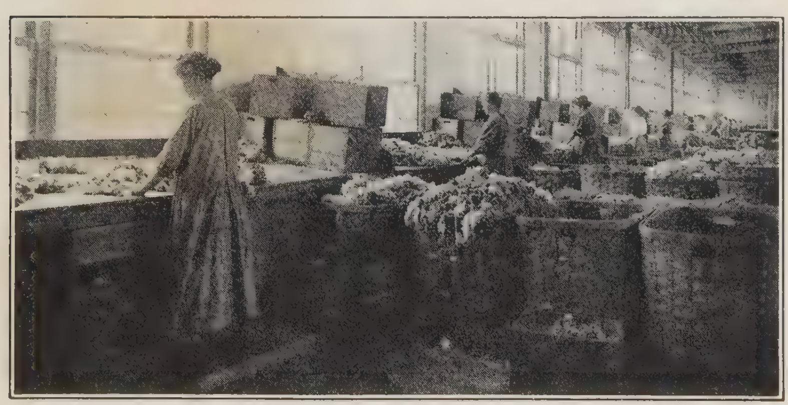
The chief wool-pulling center in Europe is Mazanet in France. There are several wool-pulling establishments in Chicago and the other meat packing cities of the United States. This wool is much inferior to the sheared wool which comes from live sheep.

Wool Selling. After the sheep rancher has his wool shorn and baled, he is interested in selling it. He can deal with traveling representatives from wool merchants who go through the sheep regions for the purpose of buying wool. He may sell it direct to the agents of the big mills, who also send their men through the sheep country to buy. He may send it to a commission merchant to be sold on consignment. When near a mill he can trade directly with the mill. He may find a buyer in some local merchant or he may sell it through some of the many wool growers cooperative societies. In some wool auction centres, he may sell it at auction; this method is common in Australia where the wool is carefully graded.

The great wool auction markets of the world where buyers and sellers meet are Sydney, London, Liverpool, Bremen, Marseilles, and Hamburg. Our chief wool markets are Boston, New York, Philadelphia, Chicago, and St. Louis. Most of our wool is not sold by auction but is bought from the grower by traveling buyers.

Preparation of Wool for Manufacturing. When the wool arrives at the mill in the form of bales, it is ungraded, very dirty and full of grease. After the bale is broken, sorters take the wool and carefully grade it as to fineness and length of fiber by tearing it into pieces and throwing similar kinds into large baskets near at hand. The wool on the various parts of the body differs in quality, as do also entire fleeces from the various animals. A skillful wool sorter quickly sees and picks out these many grades after long practice.

Because of the dirt and dust, the wool is sorted on slatted tables through which the air is being sucked downward. This keeps the dirt out of the air and prevents sickness. After sorting, the wool is washed in soapy water and thoroughly rinsed. This gets out the dirt and grease. So heavy is the wool from dirt and grease that oftentimes as much as seventy-five per cent of the weight of the wool is composed of them. When the wool comes from its bath and has been dried, it is sometimes sprinkled with oil to keep it from becoming too dry and hard.

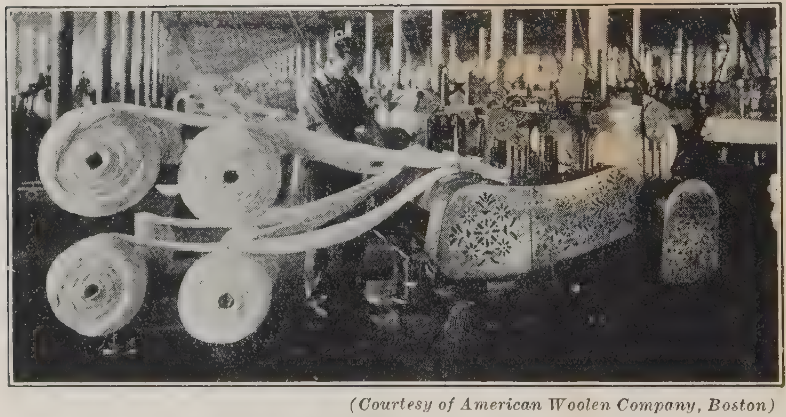


(Courtesy of American Woolen Company, Boston)

FIG. 128. SORTING WOOL

The Manufacture of Wool. Wool fiber is used in two different ways. The longer fibers are combed out parallel and spun into worsted threads by special processes. This class of woolen goods is known by its hard, straight threads and well marked patterns in goods and is called worsted.

The shorter fibers are used to make goods called woolens, which are known by their softness and loosely woven patterns. The short fibers, after being carded, are spun into woolen yarn and woven on looms. After they have been shrunk in baths, the pieces of goods are then teasled by a process which draws up the fuzzy woolen nap and makes the cloth woolly in appearance like blankets. After teasling, the cloth is shaved off to a uniform nap and we have our woolen cloth.



(Courtesy of American Woolen Company, Boston)

FIG. 129. SCENE IN WOOLEN FACTORY

Wool is also used in knitting. For this purpose are used special knitting machines which interlace the threads without weaving and thus make sweaters, stockings and underwear.

Wool is also used to make felt. In this process the fibers are pressed together and, because of their characteristic scale-like formation, remain so. After being pressed and pounded, the result is a piece of felt with which we are familiar. In the cheaper grades of felt, other wools than those of sheep are often used, but some of the poorer grades of wool lend themselves well to the making of woolen felts.

Remanufactured Wool. If we depended upon the annual supply of wool from sheep alone, our wool clothing would be much more costly because the annual supply of virgin wool is not sufficient to satisfy the annual demand. Woolen rags, cuttings from tailors, and the waste wool from mills are used in making up what is called shoddy wool.

The rags are pulled apart and the fibers loosened so that they can be respun. Oftentimes these short fibers are mixed with wool that is fairly strong. From this supply of shoddy mixed with good wool many of our suitings are made. It is a great saving to use this reclaimed wool and entirely justifiable from an economic viewpoint. People buying woolen goods should, however, be aware that the goods are made in some proportion of shoddy wool, for when shoddy is present, the wearing qualities of the goods are weakened because of the short fibers. Mungo is similar to shoddy but is made from the hard yarns and worsted fabrics.

Many of our clothes are made from adulterated wool. This is done by mixing cotton threads among the woolen threads. Silk is also used to supplement wool. Some of our so-called woolen suits are half cotton. In the making of carpets, it is quite common to use some of the minor vegetable fibers like jute and hemp for cross threads and backings.

Miscellaneous Animal Fibers. Although silk and wool form the principal animal fibers of commerce, we find also other sources. Around the shores of the Mediterranean Sea, in southern Europe and northern Africa, large quantities of goats furnish commerce with goats' hair and wool.

In Angora in Asia Minor there are more goats than anywhere else in the world. The Angora goat is noted for the length and fineness of its wool and brings a high price. Some of these goats have been imported into our country and are now being raised here. Another goat, called the Tibetan goat, furnishes a very fine wool called cashmere, from which are made the wonderful cashmere shawls. Because of the small amount of this wool grown on each animal and the large amount of hand skill necessary, these shawls are very costly. This wool is also used in other fine textiles.

The yak is an animal used as a beast of burden in the Himalaya Mountains. From it are obtained some very fine hair and wool. The hair is used to make rope and tents, while the wool is used to make fine cloth.

The hair of camels of hot countries is used for paint brushes and tents. In colder climates in Asia, the camels have long soft wool which is used to make soft warm cloth used much in winter clothing.

The llama of South America is a beast of burden in the Andes Mountains. This animal furnishes a wool which is used locally to make clothing. A similar but smaller animal called the alpaca furnishes a soft wool which is shipped to England and America, and made into fine dress goods called alpaca. Many small animals like the beaver and rabbit furnish fibers which, when felted, make the felt of our hats.

TEXT QUESTIONS

1. How do we know that wool has been in common use from earliest times?
2. What changes have been taking place in wool growing in late years?
3. What countries lead in wool growing? What states?
4. What countries lead in wool manufacturing?
5. From what countries do we import wool?
6. Describe the different kinds of sheep and their uses.
7. What sheep are the best wool producers?
8. Describe sheep raising fully.
9. How are sheep sheared? Contrast methods in Australia and the United States.
10. What is pulled wool? Where are wool-pulling factories located?
11. How is wool sold? Which is the best way? What are the largest wool markets in the world? Locate them.
12. How is wool prepared for manufacturing?
13. Describe how wool is made into cloth.
14. Distinguish between woolens, worsteds, felt, and shoddy.

PROBLEMS AND PROJECTS

1. Collect pictures of silk in all its stages.
2. Make an outline map showing countries of silk production and silk manufacturing.

3. Why do we not raise more silk in the United States where certain regions have an ideal climate and suitable growing conditions? Explain.
4. Collect samples of silk thread and cloth. Compare them.
5. Contrast samples of artificial silk with real silk.
6. Collect pictures of wool growing and wool manufacture.
7. Collect samples of wool.
8. Find out how to determine wool cloth from cotton.
9. What are the current prices of silk? Of wool? Are they higher or lower than last year? Why?
10. Collect samples of animal fibers and be able to state where each one comes from and what it is used for.
11. Make an outline map showing wool producing regions of the world and the location of the great wool manufacturing centers.
12. If you were a rag man, how would you sort the rags to sell? Which would be worth the most? Why? What would each kind of rag be used for?

TOPICS

1. The increased use of silk in the last twenty-five years.
2. Silk culture in the United States.
3. Artificial silks.
4. How to detect real silk from artificial silk in cloth.
5. The transportation of silk.
6. The silk industry in Paterson, New Jersey.
7. The factors that determine the price of wool.
8. Wool growing in our West.
9. Wool growing in Australia.
10. The supply and demand of wool.
11. Comparison of the qualities of the various textiles.

FOR CLASS DISCUSSION

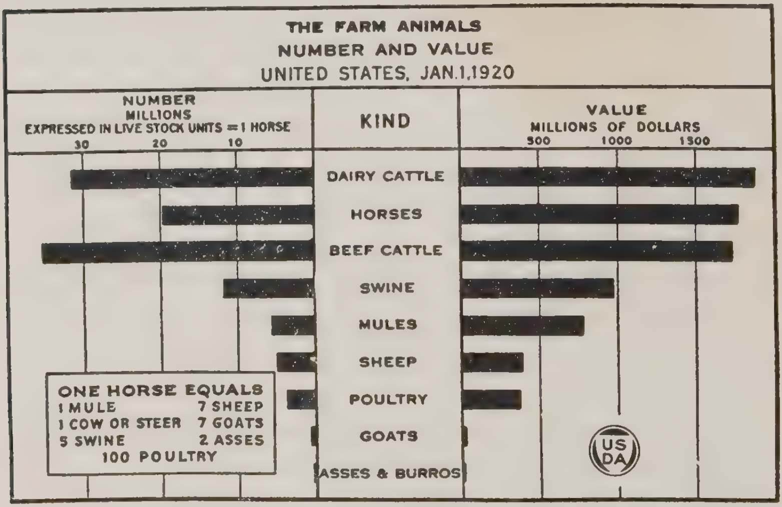
1. Silk is a necessity.
2. Wool growing offers a good opportunity for investment.
3. The government should label all textiles, indicating their exact composition.

CHAPTER XVIII

CATTLE

SECTION 1—MEAT PACKING INDUSTRY

The Meat Supply. Primitive man, in the hunting stage, killed animals in self defense or for food. As a food supply, wild animals were uncertain and irregular, a successful hunt being followed by feasts, and a scarcity of wild animals resulting in starvation. In the pastoral stage, man learned to domesticate some types of animals and thus insured a regular meat supply.



(Courtesy U. S. Department of Agriculture)

FIG. 130. NUMBER AND VALUE OF FARM ANIMALS IN U. S. IN 1920

In the agricultural stage, man trained the domesticated animals to work for him and so secured beasts of burden and draft as well as a food supply. By intelligent breeding through the centuries, man has improved these domesticated animals until today they are indispensable to him.

In densely populated regions like Europe, the meat supply has been kept up by intensive farming and dairying. In our country we look to the western grazing lands, the corn belt, and the eastern dairy farms for our beef supply; to the corn belt, for our pork supply; to the western plains, Australia, and South America, for our mutton supply. On the frontiers where grazing is the principal occupation, meat is still plentiful.

The Orient cannot afford meat, because the population is so dense that the land is too valuable for the support of animals, being needed to raise crops to support the people. The people of China and Japan live almost wholly upon vegetables. India, where twenty-five per cent of the world's cattle is raised, eats little meat because of religious beliefs and also because of the dire poverty of its countless inhabitants. Here cattle are used for work although some beef is exported to more prosperous countries like England. The proportion of meat in the daily diet of a people is somewhat of an indication of their relative prosperity.

The Geography of Meat Production. While India leads the other countries in the number of cattle raised, her contribution to the meat supply of the world is not important. The United States, as a country, leads all others in beef production, although her beef exports have fallen off greatly because of the increasing home demands. Western Europe, as a region, has more cattle than we have in the United States, but her countries are relatively smaller than ours and so no one country ranks high. There also, the local demand prevents a large export trade in beef, although there is considerable trade between nearby countries.

The countries which lead in beef export are found in South America, principally Argentina, Brazil, and Uruguay, which, because of their small populations, can export their large surplus. In our country, cattle raising regions are the western plains, the corn belt, and the eastern dairy farms. Our great meat packing centers are Chicago, Omaha, St. Louis, St. Joseph, Kansas City, Indianapolis, St. Paul, and Sioux City. There are also large slaughtering houses in the large cities of the East, including New York, Buffalo, Boston, and Jersey City, while in the West we find Portland, Fort Worth, and Denver.

Hogs are raised almost everywhere, but generally local demands prevent much exporting. In this country, we grow more hogs than anywhere in the world and we raise not only enough pork for our own demands, but export great quantities all over the world. There is no region in the world that can compare with our corn belt in the swine raising industry. Our pork packing centers are located near the corn belt. Chicago leads all others. Other important pork packing cities are Cincinnati, Omaha, Kansas City, and St. Louis.

Mutton is raised in large quantities in the temperate zone countries. Argentina and Australia are the great mutton exporters, other regions, as a rule, consuming their own local supply. We import mutton.

Domestic Animals in America. The American Indians had no domesticated animals for food supply. All our domestic animals were brought from Europe. Columbus brought some cattle with him in 1493. Later, the Spaniards brought over the ancestors of the wild horses and cattle of our western plains. The settlers along the coast imported their domestic animals from their home land. Eventually these increased in numbers and became an important source of food. During the early years, little attention was paid to the quality of the animals, but during the last century, great strides have been made in the improvement of the breeds, until now we have reached a high degree of perfection in the type of our meat animals.

As the pressure of increasing population lessens the amount of the land which can be used for our animal industries and makes the demand larger, more and more attention will be paid to increasing the meat-producing qualities of the various animals. This has been done to a great extent in the cattle industry. The old Texas long-horn cattle of the range have been displaced and now we have the shorthorn cattle noted for their beef qualities.

Our swine also have been improved, until now types of hogs superior for pork have driven out the inferior kinds. Our sheep have been given attention also, as we have seen. We now have certain breeds that are grown for their mutton qualities only, while other types, like the merino, have been improved for their wool-growing possibilities.

(Courtesy U. S. Department of Agriculture)

FIG. 131. TWO-YEAR OLD STEERS IN GREAT PLAINS AREA

The Shifting of the Cattle Industry. Up to the middle of the last century, cattle raising was confined principally to the eastern and southern coast states, New York and Pennsylvania leading. Ohio, because of her extensive corn fields, was important also and shipped her cattle eastward to the large cities. From 1850 on, we see the cattle industry moving westward to the great plains where the land was unsuitable for agriculture because of too little rainfall, but excellent for grazing vast herds of cattle.

In 1870, the use of refrigeration, followed in a few years by the invention of canning meats, increased this westward movement of cattle raising and at the beginning of the present century we find the cattle raising industry well located west of the Mississippi.

A centralization of the slaughtering industry also took place and the large meat packing centers of Chicago, Omaha, Kansas City, St. Louis, and others near the cattle ranges, became the principal sources of beef. The formation of large meat packing companies, the use of refrigeration, the canning of meat, and the improvement of transportation facilities soon put the local slaughter houses out of business except for remote communities or for the killing of local dairy stock, grown too old for further use.

(Courtesy U. S. Department of Agriculture)

FIG. 132. STEERS FATTENED ON BLUE GRASS PASTURE IN WISCONSIN

Cattle in the West. Until after the Civil War, great herds of wild cattle, descendants of those that escaped from the Spaniards of the sixteenth century, roamed the western plains. Because of limited transportation facilities and the expense of getting the cattle to market, these cattle had not been of value commercially; but the increased demand for meat in the East, improved transportation facilities, and meat-packing inventions made them of greater value.

At first, the great plains were free to anyone who wanted to graze cattle on them. In Texas, great land grants fixed the ownership of tremendous stretches of grazing land. Farther north the great plains belonged to the government, which frowned upon private ownership of great ranches. As there is a wide stretch of land east of the Rocky Mountains that is not good for farming, the cattle industry located there. For years the government did not limit the use of these plains for grazing and everyone that wished to could graze his cattle on them. In later years the government limited the grazing privilege to ranchers having permits and so prevented over-stocking the ranges.

As this land is still unfenced, the various herds of different cowmen roam at will and become intermixed. In order to protect their rights of ownership, the owners all brand their cattle with individual marks. This is done when the cattle are calves. Twice a year the ranchers combine their forces and round up the cattle. The calves are separated from the herd and branded. As the mother of a calf has a brand on her, it is easy to tell to whom the calf belongs. Branding is done by placing a hot iron on the skin and burning a mark on it.

After the cattle have grazed on the range until they reach maturity, generally about three years, they are rounded up and shipped, either directly to the meat packing centers or to the farms of the corn belt. In the corn belt they are fattened on corn for about six months and then are ready for their journey to the slaughter house.

Swine Raising in the United States. Along with the other domestic animals, swine were imported from Europe. In early times, the hogs were allowed to roam and were not kept in pens. This resulted in a lean, rangy animal, with much lean meat and little fat.

In the beginning of the last century attention began to be paid to improvement in hogs, with the result that several famous breeds have come to the front, such as the Berkshire, Duroc, and Poland-China. These breeds are noted for their superior qualities and quantities of pork, and are known as "lard hogs." Canada, England, and Denmark breed hogs to secure lean bacon, and in those countries we find the so-called "bacon-hog."

Before the Civil War, the pork industry was increased, particularly in the corn belt states, because of the southern demand for pork and bacon with which to feed the slaves. This combination showed the value of fattening hogs on corn and led to extensive raising of hogs. Although swine have always been raised locally for domestic consumption, the swine raising industry as such is now centered in the corn belt of the United States, where more hogs are raised than in any two countries of the world combined.

Hogs are great meat producers as they fatten quickly, mature rapidly, and are prolific. Where corn is cheap, it is good business to raise hogs because the returns are better from them than from corn. The turnover is quick, and the natural increase rapid. Within a year the hog is ready for the pork packer.

Mutton Production. In a previous chapter, we discussed sheep raising for wool. Many of these wool sheep find their way to market eventually as mutton. Many sheep are raised principally for their mutton. More attention is paid to mutton qualities in sheep in the more densely populated regions because of the demand for meat, while the less densely populated regions pay more attention to the wool qualities.

In this country our mutton sheep are raised chiefly in the eastern sections, but our wool sheep from the western plains are also a big factor in the supply. We import large quantities of mutton from South America and Australia, where the mutton is frozen after butchering and kept chilled on its long sea voyage until arrival here. Great quantities of this mutton go also to England and other parts of Europe. The sheep slaughtering industry is one part of the great meat packing centers of our country, and there thousands of sheep are killed daily.

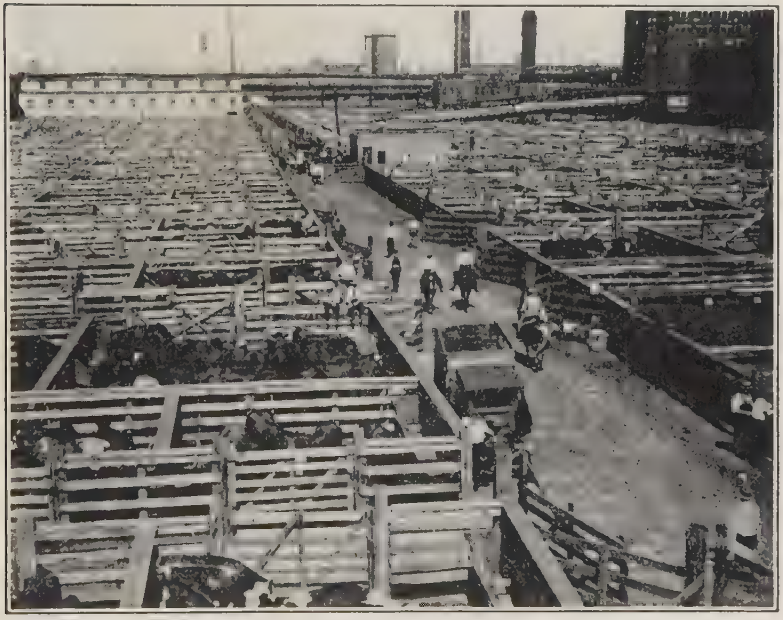
The Chicago Stock Yards. As Chicago leads all other cities in the volume of its meat packing, we can examine briefly the methods used there. During the last fifty years it became necessary to organize the receipt and handling of the thousands of animals arriving daily. This resulted in the formation of the great Union Stock Yards. Here are arranged hundreds of pens for receiving and caring for cattle, and large two-storied sheds for swine and sheep.

Banking facilities are near at hand and the large packing houses, whose names are known to us all, are ranged around the yards nearby. This concentrates the industry into one central place and speeds up the business.

When the trainloads of animals arrive, the animals are quickly driven into receiving pens. The cattle are later placed in pens and watered, fed, and allowed to rest. Swine and sheep are driven to covered sheds for rest and food. Hogs are generally given a shower bath to cool them after their long hot ride in the cars.

Early in the morning, the buyers and the sellers go through the pens and sheds to bargain for the animals. The buyers generally consist of men representing the large packing houses, and agents representing farmers who want to buy cattle for fattening. The sellers are represented by commission agents to whom they have consigned their animals for sale.

Government inspectors inspect all animals for disease and injury, and the animals found in poor condition are removed and slaughtered for purposes having nothing to do with human consumption.



(Photograph by Ewing Galloway, N. Y.)

FIG. 133. UNION STOCK YARDS, CHICAGO

After the sale has been completed the animals are weighed by the stock yard officials whose records are accepted by both buyer and seller. The transactions are on a cash basis and the weight certificates can be cashed at the bank, at any time, right in the yards.

Beef Packing. The cattle are now driven from their pens to the packing house for which they have been purchased. From the runway they are shut into small open stalls, where they are stunned by being hit between the eyes with a long handled hammer in the hands of a skilled man. They are then attached to an overhead trolley system, and from then on the entire process of butchering is carried on in a very highly organized and a very sanitary way. So highly organized is the work that the animal passes through the various processes and arrives at the cooler in less than forty minutes.

Two hundred and fifty cattle can be handled every hour because the work is subdivided into several skilled operations, each done by a trained man who does nothing but his one job. During the process, four different inspections are made by government inspectors who place the government stamp of approval on accepted meat and cause all other to be condemned.

After staying three days in the cooler, where the temperature is kept just above freezing, the meat is cut up into the various cuts and shipped to market in refrigerator cars. Upon arrival at its destination, it is kept in cool rooms until ready for the retailer and customer. In this way, meat is kept good for long periods of time, and it is possible to ship it long distances, even to Europe, by the use of refrigerator ships.

One of the things that has distinguished American meat packers is the wonderful use of all parts of the cattle. About 57% of the live weight of an animal results in meat. The remainder is used entirely in some form of by-product so that no waste occurs in our large establishments. This reduces the cost of our meats and also furnishes us with many valuable by-products.

Pork Packing. In this country, pork packing has reached a very important place, not only in our meat supply but in the world supply. Our products go everywhere. The same wonderful organization and subdivision of labor are found in the pork packing establishment as in the beef, although the processes differ somewhat.

After cooling sufficiently, the hogs are cut up into various cuts as desired, the fresh pork going at once to the market. The hams are cured in pickle and then smoked. The bacon is cured also in large rooms especially built for this process. The trimmings are mixed together with beef trimmings and spices, packed into sausage casings, and shipped to the market in the forms of all kinds of sausage from frankfurters to bologna. Some pork is salted, some is packed in tins, and some parts of the hog are refined into fine lard. In this industry, as in the beef industry, great attention is paid to the use of all parts of the hog and "everything but the squeal" enters into some form of by-product.

TEXT QUESTIONS

1. Contrast the meat supply in Europe and America. Why the difference?
2. Contrast the meat supply in Argentina and China. Why the difference?
3. Why is the meat consumption low in India although this country leads in cattle raising?
4. What conditions prevent a large export of beef from the United States? From Europe?
5. What countries lead in beef exports? Why?
6. What three general regions of cattle raising are found in the United States?
7. Where are our great meat packing centers? Why?
8. What effect has transportation had on these locations?
9. What are our leading pork packing centers?
10. Discuss the history of domestic animal raising in the United States.
11. Show how the cattle industry has shifted since 1850.
12. Describe the cattle raising industry in our West.
13. Describe the cattle industry of the corn belt.
14. Describe swine raising in the United States. Abroad.
15. Why are hogs well suited to dense populations?
16. What effect did slavery have on the location of hog raising? Why?
17. Where does our mutton come from? How is it shipped?
18. Describe the Chicago stock yards.

SECTION 2—LEATHER

Importance of Leather. The first clothing of early man was probably made from the skins of animals killed in the hunt. Man learned to roughly cure, or tan, these skins so they would be more comfortable and last longer. At first he cured them with the hair on, for additional warmth, and even today, we find an extensive business carried on in the skins of fur-bearing animals.

The process of de-hairing and tanning the skins into leather was well known before written history. The earliest records we have show that man knew and used leather. Inscriptions in ancient Egypt and records hundreds of years old from China, tell us that leather was much used. Our old Greek and Roman writings constantly refer to skins and leather. The Bible tells us of Simon the Tanner.

Throughout olden times, and down through the centuries until the coming of cheap cotton, leather was one of the most important sources of clothing. At the present time, an inventory of our clothing and other useful articles will disclose how important a part it plays in our everyday life. Among the more important articles of leather are shoes, gloves, caps, book bindings, luggage, machine belts, purses, belts, and automobile accessories; over 75% of our leather is used in the shoe industry. The making of leather and its manufacture into useful commercial articles are among the leading industries of the world today.

The United States ranks well ahead of all other countries in the tanning of leather, and recent estimates place our production equal to that of all the rest of the world combined. We use around 120,000,000 hides and skins a year. Because of its important place in commerce and industry, leather justifies our interest.

The Geography of Leather. The great livestock-raising countries of the world are the principal sources of hides and skins. The tanning industry is generally located near the source of tanning materials, although this is not as essential as formerly. The abundance of tanning materials in this country has given us advantages which have resulted in our leadership of the tanning industry.

Notwithstanding our large domestic supply of hides and skins, we are obliged to import heavily from countries having a surplus, to keep our tanneries supplied. The principal imports in this line are as follows: hides from Argentina and Canada; calf skins from Canada and France; sheepskins from New Zealand, Australia, and Argentina; and goat skins from India and China.

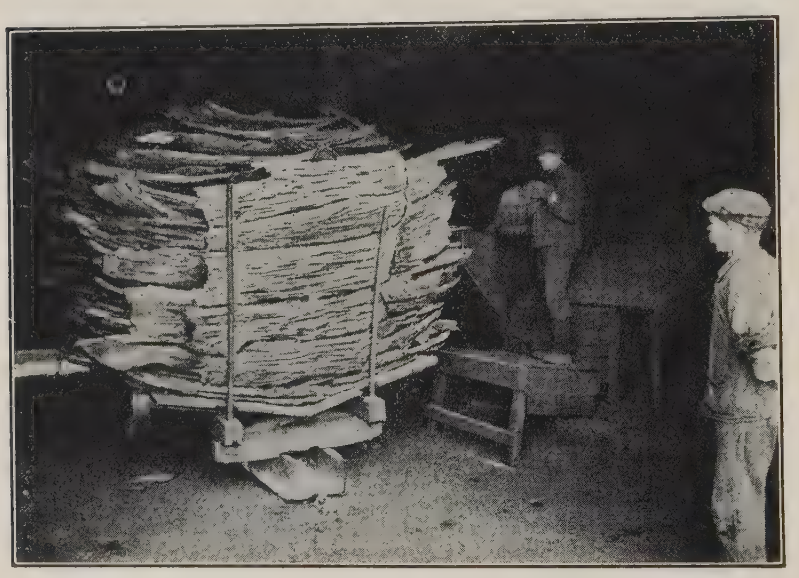
Our exports of leather greatly exceed our imports. The latter are principally special leathers, which come from the other leading tanning countries of the world, Canada, the United Kingdom, Germany, and France. During colonial days the tanning industry was scattered throughout the thirteen colonies wherever tanning material was at hand. With the cutting away of the forest, the smaller tanneries disappeared and we find a concentration of the industry occurring.

Pennsylvania has large hemlock forests and, as a state, leads in tanning. Several factors have contributed to the concentration of the tanning industries into a few large centers, such as the discovery of the chrome tanning process, the concentration of tanning materials into extracts near their source, which enables the tanneries to ship them in small bulk, and the advantages of large-capital organization. Our leading tanning centers today are Philadelphia, Chicago, Milwaukee, Newark, and Boston.

Classification of Skins. The skins of fur-bearing animals are called pelts and after being tanned with the fur still on are called furs. The skins of large animals like cattle and horses are called hides. The skins of animals like deer and calves are called kips. The skins of smaller animals like sheep, pigs, and goats are called skins. The skins of various other animals like elephants, kangaroos, alligators, snakes, sharks, and porpoises, and many others can be classed into one of the above grades. All of these skins, except furs, are tanned without the hair, and are called leather.

Hides are classified as raw or green hides when fresh from the animal; salted or dried hides, when prepared for keeping and transportation; and tanned or cured hides, when made into leather. Every class of skins and leather has some particular use to which it is put, and experience and skill have enabled man to procure and make these various kinds and classes of skins into those articles for which they are best intended.

The greatest sources of leather are found in the skins of domestic animals, although there is a commerce of much importance in the rarer skins of animals which are not domesticated. The methods employed in tanning and curing also produce leathers of varying qualities and uses, and a detailed knowledge of the leather business requires much study and experience. We can only take a brief look at the industry as a whole in its relation to commerce and industry.



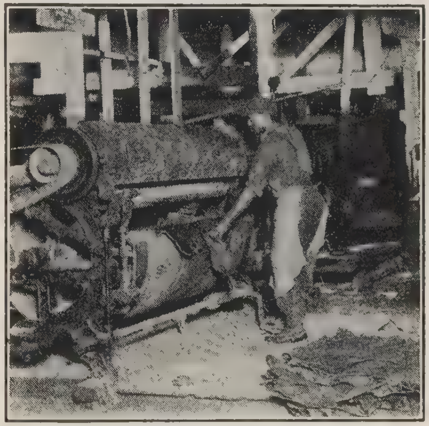
(Keystone View Company, Inc., N. Y.)

FIG. 134. GRINDING HEMLOCK BARK

Tannic acid is secured from hemlock bark.

Tanning Materials. The bark and fruits of some trees are rich in tannic acid and these are used for tanning materials. Present day methods make extracts from these materials and ship the extracts to the tannery, rather than the commodities themselves, so as to save on transportation costs. The principal trees which supply bark for tanning are the oak, willow, hemlock, birch, and chestnut. Other sources of tanning materials are sumac leaves, valonia acorns, quebracho chips, myrobalan, dried fruits, divi-divi pods, and oakgalls.

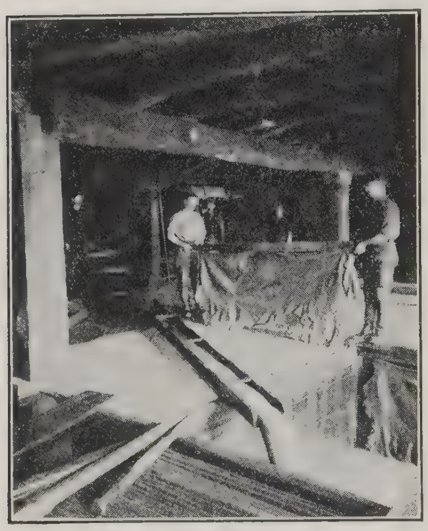
In 1850 the discovery of the chrome process of tanning led to important changes in the tanning industry. It was found that solutions of chromic acid, a mineral substance, could tan light-weight skins quickly, and now large amounts of this substance are used. Mixtures of eggs, flour, and oil are used to cure some of the lighter skins.



(Keystone View Company, Inc., N. Y.)
FIG. 135. REMOVING HAIR FROM HIDES

The Tanning Process. To preserve hides until they are ready for tanning, several methods are used. Some hides are dried in the sun, some are first salted and then dried, some are kept in salt brine pickle, while others are smoke dried.

Upon arrival at the tannery, the hides are soaked in water to soften them and to wash away any loose dirt. They are then placed in pits full of lime solution, which loosens the hair. From the lime pits, they pass through a machine which scrapes off all the hair, after which pieces of loose flesh are shaved off the flesh side. The hides are then soaked again in a weak acid solution to rid them of any lime and to open up the pores of the skins. This process is called deliming or swelling. They are then placed in the tanning pits in which are solutions of tanning materials. From time to time the hides are moved around and the solution made stronger. The hides stay in these tanning pits for varying lengths of time depending upon the weight of the skin, the strength of the solution, and the purpose for which they are intended. It takes from six months to a year to tan good sole leather by this process.



(Keystone View Company, Inc., N. Y.)
FIG. 136. TANNING AMERICAN LEATHER

The chrome method of tanning was discovered in 1850. In this process chromic acid, from mineral sources, is used. Only light-weight skins can be tanned in this process. The skins, after the swelling process, are placed in huge horizontal tubs in which is the chrome solution. The tubs or barrels are revolved over and over and the skins kept constantly in motion, similar to clothes in a washing machine. In about eight hours the skins have become tanned. The advantages of this process are its cheapness and speed. It is not successful for heavy leathers or those intended for hard wear.

Skins are sometimes cured by a process called tawing. After the skins have been de-haired they are soaked in a solution of bran and water, and alum and water, after which they are coated with a mixture of water, flour, and eggs. The skin is cured by the action of the eggs in the pores, and when finished, gives us a soft flexible leather.

Chamois skin is made into a soft leather by almost the same process except that oil is used in place of eggs. Russia leather is tanned by a solution of birch bark, which gives it an odor offensive to insects. For this reason, it is used for book binding. Our patent leather is leather which has been stretched and then painted with enamel and varnish. Cordovan leather was originally made in Cordova, Spain, from horse hides. Most of it is now made from horse hides shipped from South America.

Leather, after tanning, is finished by several different processes. Machines with sharp knives split it into sheets of uniform thickness. Other machines work oil into the pores and soften it. Heated rollers iron it out smooth, while still others polish it. Some machines emboss it with designs. Ingenious machines measure the number of square inches in every piece.

When finally the leather is finished, it is wholly different from the original hide or skin, not only in appearance, but in its physical properties. It will not decay and will last a long time under proper conditions.

TEXT QUESTIONS

1. Discuss the importance of leather in ancient times. At present.
2. Where do our hides come from? Our skins?
3. Why does the United States lead in tanning? What are the other leading leather manufacturing countries?
4. What factors led to concentration in the tanning industry in the United States?
5. Where are our leading tanneries located?
6. Explain the westward movement of tanneries. Why did some stay in the East?
7. How are skins classified? Name some of the animals that contribute to leather. How are hides classified?
8. Name some of the principal tanning materials.
9. How are hides preserved until ready for tanning?
10. Describe the tanning of heavy hides.
11. Describe the chrome method of tanning skins.
12. What is tawing? Chamois skin? Russia leather? Cordovan leather? Patent leather?
13. How is leather finished after tanning?
14. Give some of the principal uses of leather today.

SECTION 3—THE DAIRY INDUSTRY

The Dairy Industry. In addition to contributing meat to our food supply, animals also supply us with the dairy products, milk, butter, and cheese. In general, cows are the source of these supplies, but in some lands goats and sheep are used. Up to the middle of the last century, dairying was wholly a local affair, and was carried on by the farmers near the towns and cities, who sold milk direct to their customers and made butter and cheese from the surplus.

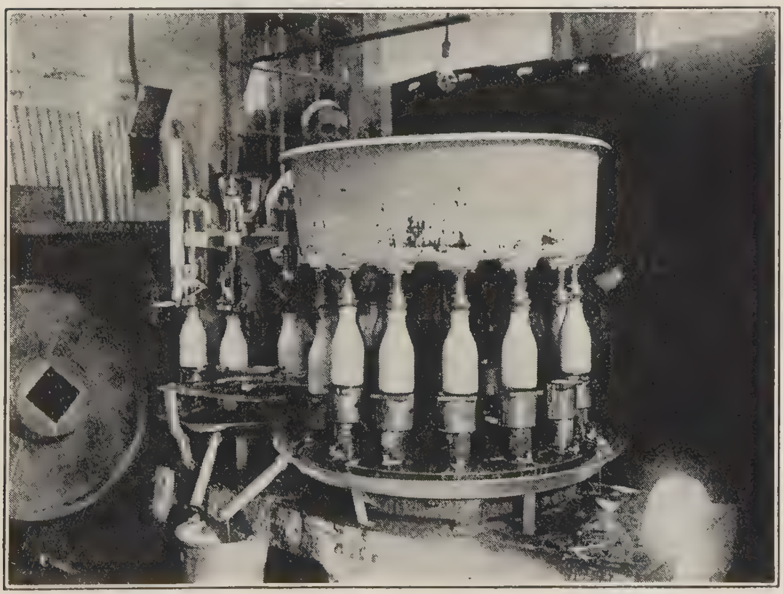
As population grew more dense and our cities grew larger and larger, this method of milk supply became more and more difficult to adjust. The coming of rapid and efficient railroad transportation made possible a change. Now, large companies collect the milk from the farmers, who are sometimes located at considerable distances from the cities. The milk is brought to various shipping points where it is bottled and distributed in the early hours of the morning. In this way a mighty river of milk daily flows cityward from widely scattered farmers.

So important has the milk supply of our large cities become that every precaution is taken to insure a regular supply of pure, fresh milk daily. It has passed from a hit-or-miss, haphazard, inefficient system to one that is highly organized and scientifically supervised. Pure-blooded cows, famous for their milk giving qualities, are now raised and kept under the most sanitary conditions. The milk is carefully tested and graded, and the utmost care is given to it at every point. While this change has resulted in increased cost, it also has resulted in improved health for our city populations.

The Geography of Dairying. Among the factors that enter into the location of the dairying industry are nearness to market, climate, and a supply of cattle food. The milk demands of our centers of population have resulted in the location of large milk farms near the cities to supply them daily with fresh milk. A cool climate aids in keeping the milk sweet and in the manufacture of butter and cheese.

Good grazing facilities in summer and an abundance of winter food in the form of grain, clover, or corn silage, are found from the Atlantic westward to the Dakotas.

Because of these factors, our northern states lead in the dairying industry, Wisconsin being the leading state, followed by New York. Our dairy products are valued at over a billion dollars a year and we produce more than any other country. Due to large home consumption, we export little.



(Photograph by Ewing Galloway, N. Y.)

FIG. 137. BOTTLING MILK BY MACHINE

Almost all the northern European countries are engaged in the dairying industry. Denmark, Sweden and Norway, as well as Holland, excel particularly in butter making. France, Holland, Italy and Switzerland lead in cheese products. Canada has built up a large dairying industry and specializes in cheese which she exports in large quantities to England. Australia and New Zealand export butter and cheese to Europe in the same refrigerator ships that carry their mutton.

The more densely populated regions of Europe eat much more cheese than we do, using it as a substitute for meats. We eat more butter per capita than any other country.

Butter and Cheese Making. With the change in the milk supply and distribution, also came corresponding changes in butter and cheese making. Formerly, butter and cheese were made in the home of the farmer and exchanged for articles at the country store. Now butter and cheese are factory-made. The farmer separates the cream from his milk by the use of a centrifugal cream separator, feeds the skimmed milk to his livestock, and carries the cream to a nearby creamery company which buys it from him after testing it for butter fat. Milk for cheese is also sold in the same way by the farmer.

Creamery companies then make up butter and cheese, using modern methods to insure uniformity and standardization of products. This change in butter and cheese making, from a home industry to a factory industry, was started in New York and has spread so widely that most butter and cheese are now made in a factory.

Great quantities of milk are preserved for future use by modern processes which result in the condensed, evaporated, or dehydrated milk of commerce. In this way, milk is made available for use anywhere and at anytime. The commerce in this milk is constantly increasing, especially in those parts of the world where fresh milk is not available.

TEXT QUESTIONS

1. What changes have occurred in the last century in the dairy industry? What has made this change necessary? Possible?
2. How is the milk supply of our large cities organized?
3. What factors enter into the location of the dairy industry?
4. Where is the dairy industry centered in our country? In Europe?
5. What other countries are important producers?

6. Why do the Europeans eat more cheese than we do? Do they eat more butter per capita?
7. Describe the organization and making of butter and cheese in our country?

PROBLEMS AND PROJECTS

1. Make a list of articles in common everyday use that come from by-products of the meat packing industry.
2. What are the chief breeds of cattle? What peculiar quality does each have?
3. On an outline map indicate the cattle raising regions of the United States.
4. On an outline map trace the journey of a piece of beef from the ranges to the corn states of the Middle West for fattening, then to the meat packing centers, and then to a consumer in Albany, New York. Over what railroads is it shipped?
5. How is the meat shipped from Australia and South America to Europe?
6. Make a list of the various cuts of meat found in a meat market. Which are the more costly? Why?
7. Why does the United States export so much pork?
8. Why are hogs the best food animals to be raised in thickly populated regions?
9. Corn in the form of pork is more profitable than corn meal. Why? Explain.
10. Where would you locate if you were to begin in the cattle raising industry? Why? Pork raising? Why? Sheep raising? Why?
11. Make a list of articles made from leather that are used in everyday life. Why are these made of leather?
12. Collect samples of leather and compare them.
13. Make a trip to a shoe factory and describe your visit.
14. Compare shoe making by hand and by machinery.
15. Compare tannic acid, tanned leather, and chrome tanned leather as to weight and wearing qualities.
16. Find out the sources of the milk supply of your community and describe the organization of the supply.

17. Why does Denmark specialize in dairy products? Where is her principal market?
18. What dairy associations exist in your community? What do they do?
19. Describe how the great cities are supplied with milk.

TOPICS

1. The decreasing meat supply and consequent higher prices.
2. A description of a meat packing plant.
3. A description of a round up on the western plains.
4. Cattle raising in Argentina.
5. Pork raising in the corn belt.
6. Our mutton supply.
7. The tanning of leather—past and present.
8. The Goodyear welt process of shoe making.
9. Automatic machinery in shoe factories.
10. The rapid and efficient transportation of meat products.
11. The milk supply of our large cities.
12. Governmental inspection of meat products.
13. Governmental inspection of milk supply.
14. Meat as a food.
15. Milk products as food.
16. The use of the by-products of meat packing plants.
17. The cooperative dairy associations and creameries.

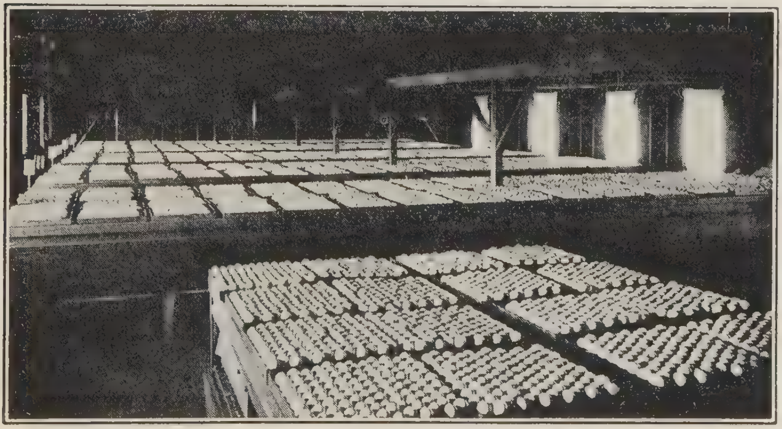
FOR CLASS DISCUSSION

1. As a nation we eat too much meat.
2. The large packing companies have benefited the public.
3. Dairy farming offers a good opportunity for investment.
4. Cold storage plants for meats lower the costs.
5. Piece work in shoe factories is fairer to labor than a day wage.
6. The leadership in shoe making is passing from New England cities to cities nearer the packing plants.

CHAPTER XIX

MISCELLANEOUS ANIMAL PRODUCTS

Poultry. Poultry and eggs are important items of our food supply. They are found almost everywhere, outside of the frigid zones, but are most abundant in the densely populated regions of the northern temperate zone. Chickens are particularly desirable as a food supply in these regions because they breed rapidly, grow to maturity quickly, yield many eggs, produce a delicious meat, and can be grown in small space on relatively cheap or waste food. Chickens form over 94% of our poultry in this country, ducks, geese, and turkeys making up the remainder. Germany is noted for her geese. Texas and Vermont lead in turkey raising.



(Courtesy U. S. Department of Agriculture)

FIG. 138. COMMERCIAL HATCHING

Most of our chickens are raised in small flocks on small farms. As a result, trade in poultry and eggs is mostly local in its nature, somewhat irregular as to standards of quality and lacking the efficiency of a country-wide organization. Since 1900 there has been a tendency towards larger chicken farms, but some of these have been failures as poultry diseases spread rapidly in these large flocks.

More and more attention is being given to improving the conditions of the poultry industry. Better hens are being introduced, with the result of better and more eggs per hen. Companies are being formed to collect and distribute eggs in a more efficient and scientific way. Rubber stamps are used on the egg shells to inform the consumer in regard to the egg's history. Better packing containers are coming into use. More attention is being paid to the preservation of the eggs. The spring surplus eggs are kept in cold storage for use in the months when the hens do not lay well.

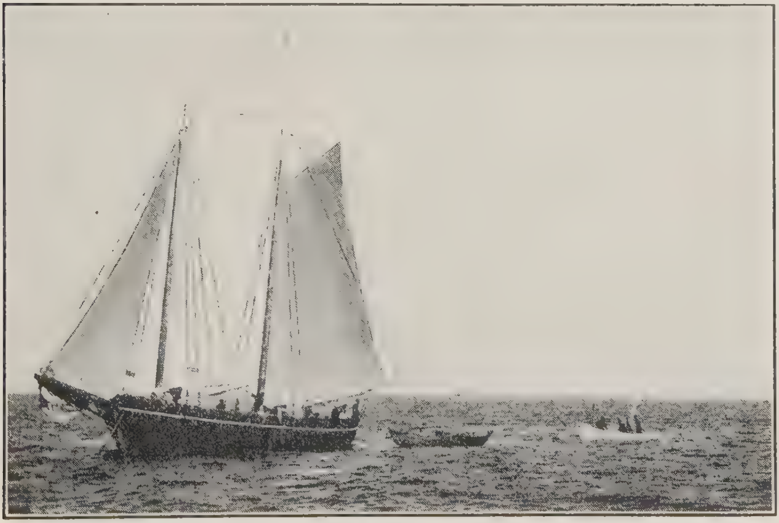
As demands increase we shall also see the supply increase and still higher organization of the methods of collection and distribution. Our production of chickens and eggs is enormous and runs into tremendous numbers. We export little, but import fresh eggs from Canada, China, and sometimes from Europe.

Russia, China, Denmark, and the Netherlands export three-fifths of the world's supply in eggs, China alone exporting almost one-fifth of the world export of eggs in the shell, and in addition great quantities of dried eggs, of which we take a large share. Great Britain imports almost one-half of the world's export in eggs. Germany, France, and Switzerland are heavy importers also.

Importance of the Fishing Industry. Man early learned to catch fish to add to his food supply. As fishing developed and boats grew larger, men ventured farther away from home, and so came into contact with other peoples. Barter and trade arose between people of different sections and commerce began.

The Phoenicians, one of the greatest commercial nations of ancient times, had their start as fishermen, later extending their voyages and trading until their commerce covered all the then known world. Every great maritime nation of history has looked to its fishing industry to furnish sailors. The nations that lead on the ocean today all have a thriving fishing industry which trains and supplies the men who man their fleets.

The fishing industry has had an important influence on the settlement and history of our country. The excellent fishing grounds near the coasts of New England were known before the colonization of New England was undertaken. Fishing became the leading industry of the early settlers.



(Courtesy U. S. Department of Commerce)

FIG. 139. COD FISHING

Later, New England became interested in the whaling industry. Ship building was also important, because of the need for fishing boats and the nearness of excellent wood for construction. For many years New England ships dominated the carrying trade of the world. The coming of the iron steamship gave the lead to England after the Civil War. New England sailors, schooled to sea life aboard her fishing fleets, have been an important factor in our commercial and naval history.

Importance of Fish as Food. As a source of food, the fishing industry is relatively unimportant to us, recent estimates placing its contribution to our total food supply very low. The number of men engaged in it is comparatively small. The total value of its products annually rank far down the list, being lower in value than many of the minor cereals and less than one-twentieth of our corn crop alone. Among the reasons for its lack of importance is the fact that fishing is a dangerous life, full of hardships, requiring long absences from home, and yielding irregular and small returns.

The popular demand for fish in the country is relatively small, as we are well supplied with other food products of a more desirable nature. The costs of catching the fish and then getting them to market leave but little margin of profit in a market where the demand drops when prices reach too high a level. As our population increases and our other sources of food become scarcer, fish will undoubtedly come more and more into demand and importance. The large populations of Japan and northwestern Europe look to the fishing industry for a larger portion of their food than do we.

The Location of the Fishing Industry. Several factors enter into the location of the fishing industry. Of these, the principal ones are climate, topography of the sea bottom, and the habits of the fish. All the great fishing regions lie in the north temperate zone, where the coolness of the water is favorable to large numbers of edible fish and the climate encourages energetic and hard working men to carry on this exacting industry. In the tropics nature supplies the people bountifully with food, hence they lack the necessary energy to exert themselves in fishing.

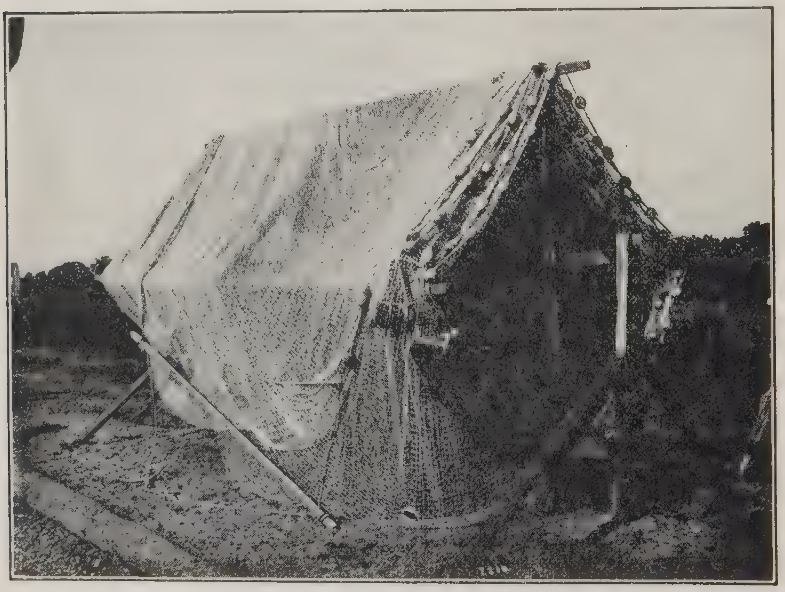
The topography of the sea bottom has a great effect in deciding the locations of the fishing industry. All the great fishing regions are in waters over coastal shelves or banks, where the ground fish, like cod, halibut, and haddock, can spawn and feed in the shallower waters. In the Atlantic Ocean, the principal fishing banks are: the Grand Banks, off the shores of Newfoundland; the West Banks, off the shores of Nova Scotia; and Jeffrey's Banks, off the coast of Massachusetts. In the North Sea, between England and Denmark, lie the Doggerbank. The Japan Bank, off the northeastern coast of Asia, is the most important fishing region in the Pacific.

The habits of different kinds of fish also help to determine the locations of the fishing industry. Some fish, like the shad, herring, and salmon, run up large rivers to spawn and are caught in great quantities during certain times of the year. This gives rise to the great salmon packing industry of Alaska and our western coasts. Other fish, like mackerel, menhaden, and bluefish, run in large schools on the surface of the water and their presence gives rise to a specialized fish industry in certain places, especially along the eastern coast of our country.

The leading countries in the fish industry are the United States, Great Britain, Japan, France, Russia, Canada, Portugal, Norway, and China. Fish is not an important article in world commerce. Spain, Italy, Portugal, and the countries of South America are importers, principally of salt and canned fish. Although we lead the world in value and quantity of our fish products, we import more than we export. Our exports are chiefly in the form of salt and canned fish.

The Atlantic Coast Fisheries. New England has always been noted for her fish products, especially her cod fish. Her nearness to the large fishing banks gives her an advantage. The fish that she supplies are mostly cod, haddock, halibut, mackerel, and hake. Herring are also found in large numbers, the small ones being canned as sardines. Lobsters furnish a valuable source of income to many fishermen in this region. The great drain upon the lobster supply has resulted in a scarcity of them and higher prices. Under governmental control it is hoped that the lobster industry will not be wholly lost. We import large quantities of canned lobster from Canada to help supply the demands.

Boston, followed by Portland and Provincetown, is the leading fresh fish market of New England. Gloucester is famous everywhere for her salt cod fish industry. Along our eastern coasts from Connecticut to North Carolina, fishing has grown in importance as the population has increased, until at the present time the value of the fish products taken from this area excels in value those of New England. Squeteague, bluefish, shad, sea bass, butter fish, and mullet are caught in great numbers for the nearby markets of the large cities.



(Courtesy U. S. Department of Commerce)

FIG. 140. DRYING A SEINE, GREAT LAKES

Chesapeake Bay is noted for its oysters which are sent to market, fresh or canned, from Baltimore. Crabs, fresh and canned, also form a valuable product. The menhaden caught along these shores are used principally for oil, fertilizer, glue, and other by-products.

As yet, fishing has not been very highly organized along our Gulf coasts, although there is an increasing interest in fishing because of the presence of rapid transportation and refrigeration. The canning of shrimp is becoming important in this region.

The coast of Florida is our principal source of sponge fishing. The center of this industry is Key West.

Inland Fisheries. Our Great Lakes supply trout, white fish, and sturgeon to the nearby markets of the cities on or near their shores. This industry is largely local and relatively unimportant financially. Our inland lakes and rivers also are sources of fish supply, but these are fished primarily for sport rather than industrially.

The Mississippi and its tributaries furnish some fish for the people along their banks, but their fisheries do not enter largely into commerce. The gathering of fresh water clams in these regions for their shells, which are made into pearl buttons, is a local industry. Sometimes pearls of value are found inside the shells.

The Pacific Coast Fisheries. Off the coast of California are found tuna fish, which are now canned and form an important item of value. Along the northern coast are found cod, herring, and halibut. Halibut from this region is shipped, by means of refrigeration, all over our country, even to our eastern coasts where they compete with the halibut caught in the Atlantic Ocean.

Salmon are the most important fish of this region and of Alaska to the north. These fish run up the rivers in enormous quantities during the spring and summer to spawn. The Columbia River is especially famous for its salmon. With all sorts of devices, from nets to fish wheels, this great horde of fish is caught by the men employed by canning factories. They are cleaned, cooked, and then packed in cans for shipment all over the world. So cheaply can they be caught and canned that canned salmon is a comparatively cheap food, even after paying transportation to points quite distant from this region.

Methods of Catching Fish. The ways in which fish are caught and sent to market, vary with the different kinds of fish. Cod fishing is carried on by large fishing vessels carrying small boats for its crew to fish in. Upon arrival at the fishing grounds, the men go out in their dories and lay their cod trawls. These trawls are long lines supported on top of the water by floats. Shorter lines, four feet apart, hang from these trawls. During the day the men draw up these short lines and unhook the cod that are caught.

When the day's catch is done, the men return to the vessel and clean the fish, after which the fish are packed on ice or in salt to preserve them until the return home is made. Upon arrival at the home port, the cod are placed on large racks in the sun to dry. They are then boned and packed in small cartons and sold as boneless salt cod. Gloucester is the principal city in the salt cod industry.

Halibut are large fish and are caught by lines and hooks. They are sold fresh.

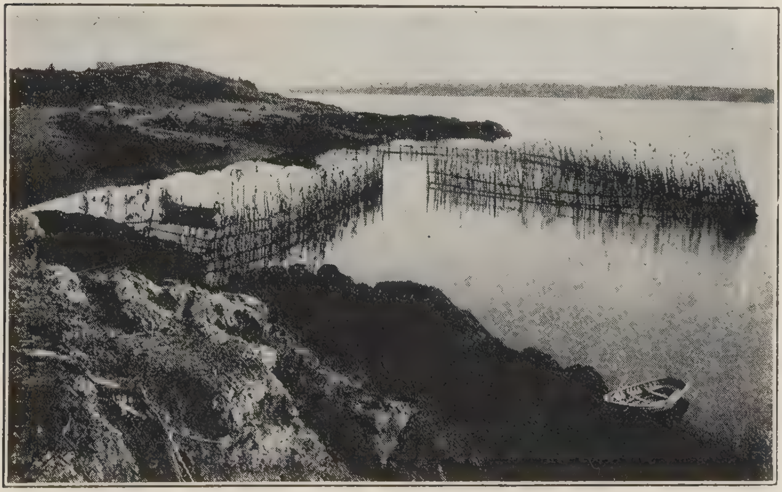
Mackerel are caught in large seines. Mackerel run on, or near, the surface of the water in large schools. A lookout on the vessel spies one of these schools and the ship then sends out its men, with seines, to net as many as possible. When the boat is full, they race back to port to get the advantage of the early market. Mackerel fishing is uncertain, sometimes resulting in a loss and at other times giving excellent returns, depending upon the run of the fish and market conditions. Mackerel are sold fresh and also pickled in brine.

Herring also are caught in nets as they run in schools. Herring are sent to market fresh, salted, and smoked. Haddock are caught by lines and hooks, and are sold fresh, or salted, in which form they are called finnan haddie.

Salmon and shad are caught in nets as they run up the rivers to spawn. Eastern salmon are generally sold as fresh fish, or smoked. Western salmon go to market principally in cans, although some are shipped to market in refrigerator cars or in a frozen condition.

Oysters, clams and lobsters, though not scientifically classed as fish, may be discussed under this heading for convenience. Oysters thrive in shallow water. These stretches of shallow water are called oyster farms. They are planted by scattering the tiny eggs in selected places. When these eggs have reached maturity they are pulled to the surface of the water by large tongs. Great care must be taken to raise oysters in beds that are sanitary and protected from contamination.

Lobsters are caught in wooden traps, which are pulled to the surface, the lobsters removed and taken to large floats, where they are kept alive by proper care and feeding until ready for market. Short lobsters that have not reached maturity are thrown back into the water. All along the coast inspectors are watching for fishermen who try to market or sell short lobsters. In this way it is hoped that the future supply will not be lost entirely.

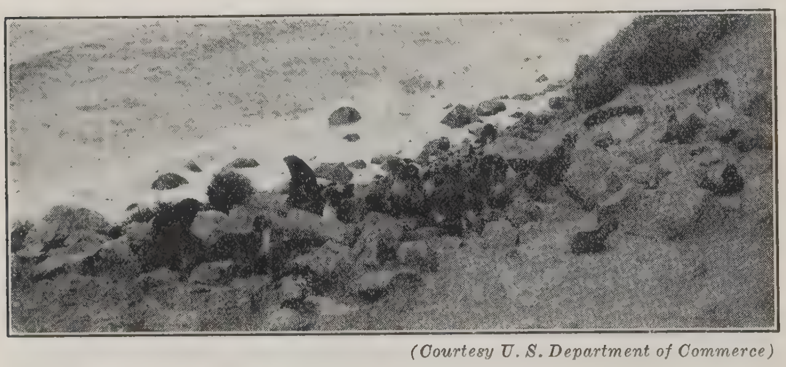


(Courtesy U. S. Department of Commerce)

FIG. 141. HERRING WEIR, EASTPORT, MAINE

Government Aid in Fisheries. The national government has a Bureau of Fisheries, which greatly aids the fishing industry by maintaining hatcheries. These hatcheries supply millions of tiny fish for distribution in places best adapted for them. Bulletins are issued helping fishermen in many ways and advising them as to the best methods of catching, preserving and marketing fish. Studies are made by this bureau to aid the industry in every way possible.

States help fishing by laws forbidding fishing during seasons when the fish are spawning and in controlling the amount and kind of fish that may be caught. Agreements between the principal fishing nations allow deep sea fishing outside of a three-mile limit from shore and in other ways help in maintaining the industry without international friction.



(Courtesy U. S. Department of Commerce)

FIG. 142. ADRIGNEN ROOKERY, ST. PAUL ISLAND

The Fur Seal. The fur of the seal is much sought after. This has resulted in the slaughter of seals almost to extinction. The Pribilof Islands, a possession of the United States in the Bering Sea, are famous for being the chosen place for seals to raise their young, for which purpose they swim great distances. Protective laws prevent the killing of seals except under governmental supervision, while raising their young on these islands.

The seal seeks its food in the ocean and swims miles for it. This makes it possible for seal hunters to shoot the seals while away from land, beyond the three mile limit within which the government controls the hunting of seals.

Formerly, seal hunters lay in wait in their ships just outside the three mile limit and killed all the seals there. This resulted in the slaughter of the mothers and the death of the young seals. Through international treaties with England, Russia, Japan, and Canada, much of this ruthless murder of seals away from land has been stopped. It is hoped that the seal industry will survive under the protection of these countries.

The Whaling Industry. This industry reached its highest point of importance during the first half of the last century, when hundreds of ships and thousands of men were engaged in it. New Bedford was the center of this industry in the United States, and from this port the whalers outfitted and sailed to the Arctic seas on long voyages in search of whales. Great fortunes were made in this industry, many of which were later invested in the textile industry. The scarcity of whales, due to their near extinction, the use of substitutes for whalebone, and the discovery of petroleum as an illuminant and lubricant, brought about a rapid decline in whaling, although whales are still hunted.

(Courtesy U. S. Department of Commerce)

FIG. 143. FINBACK WHALE JUST KILLED

In the place of the old wooden whale ships, steamships with modern equipment for killing and rendering the oil from the whale are now employed. Most of these now sail from San Francisco, which is nearer the present whaling grounds in the Bering Sea. Some whales are now caught in the Antarctic Ocean while a few are still found in the northern Atlantic Ocean.

Furs. Since the beginning of time, man has used the skins of animals for protection against the cold and wind. In the colder climates, furs have always been the most common article of clothing. Even when they are not needed for warmth furs are often used for ornament.

Although the tropics contribute some furs, such as those of the leopard, tiger, lion, and monkey, it is from the colder climates of the northern hemisphere that we get most of our commercial furs. Here nature provides the animals with a finer and warmer coat and here, also, is found much unoccupied land, where the wild fur-bearing animals can survive. Because of the large demand and decreased source of supply many furs are now very costly.

Canada, Russia, and Siberia lead in the production of the most valuable furs. The United States contributes a large amount of the less valuable furs. From South America we get the fur of the Coypus, which gives us nutria, and also the fur of the chinchilla. Australia contributes a large amount of rabbit skins and also sends the kangaroo furs to the fur market. The most valuable furs come from the sable, the mink, the seal, the ermine, and the black and silver foxes. Among the animals that furnish the greatest amount of furs to commerce are found the squirrel, the cat, the rabbit, the muskrat, and the beaver.

The leading fur markets are London, New York, Leipzig, Lower Novgorod, and St. Louis. The fur industry furnishes work for many trappers, also for many skilled workers who finish pelts after they reach market and make very attractive and useful clothes from the finished furs.

TEXT QUESTIONS

1. Why is poultry particularly valuable in dense populations?
2. What is the importance of the poultry industry in our country?
3. What modern methods are now being used to improve the poultry output?
4. What countries enter into commerce in poultry products?
5. Show how fishing naturally led to commerce in ancient times.
6. Discuss the effects of the fishing industry on New England.
7. What is the relative importance of the fishing industry as a source of food in the United States? Why?

8. Where is the fishing industry more important as a source of food? Why?
9. Name and discuss the factors that enter in the location of the fishing industry.
10. Locate the principal ocean fishing regions of the world.
11. Where are the principal river fishing regions?
12. What countries lead in fisheries?
13. What can you say about our exports and imports of fish?
14. Discuss the Atlantic Coast fisheries.
15. What are the leading fish markets of New England?
16. Why has the region south of Cape Cod become more important as a fish region than that north of it?
17. In what does Chesapeake Bay excel?
18. What are menhaden used for?
19. What does the Gulf Coast produce?
20. Discuss inland fisheries.
21. Describe fully the salmon fishing and canning industry.
22. What other fish are found along the Pacific Coast?
23. Describe the different ways in which fish are caught and sent to market.
24. How are oysters raised? Lobsters caught?
25. How does the government aid fisheries?
26. Describe the fur sealing industry.
27. Discuss the whaling industry, past and present.

PROBLEMS AND PROJECTS

1. Collect pictures showing the different kinds of poultry. Which kind is best for eggs? For dressed poultry? Why?
2. Where would you locate if you were beginning in the poultry raising industry? Why?
3. Gather statistics and compare the poultry industry with some of the other industries in point of volume and value.
4. Why is the Middle West so popular for large henneries?
5. Collect pictures of the fishing industry. Locate each picture.

6. What fish are canned? Gather labels showing as many different kinds as you can.
7. What has the government done to aid fisheries in your locality?
8. Make a list of all the fresh water fish you know of. All the salt water fish you know of. What ones are found near your home?
9. What international troubles occur in the cod fish industry?
10. What international troubles occur in the fur seal industry?
11. Explain the decline of the whaling industry.
12. Where is fur trapping now carried on? Describe methods.

TOPICS

1. The importance of the poultry industry in the United States.
2. Present day methods in raising poultry for market.
3. Cod fishing—a description.
4. Salmon fishing—a description.
5. Pribilof Islands.
6. The old time whaler.
7. The Hudson Bay Company.
8. Trappers of today.
9. The fishing industry of the Great Lakes.
10. Furs as apparel.
11. The more important furs found in the market today.

FOR CLASS DISCUSSION

1. Laws which will do away with cruel methods of trapping wild animals should be passed.
2. Poultry raising offers a good opportunity for investment.
3. Fishing yields good returns for the labor expended.
4. Fishing laws violate personal liberty rights.
5. Lobsters are worth their price.

CHAPTER XX

NON-METALLIC MINERALS

SECTION 1—COAL

The Formation of Coal. Coal is a mineral of vegetable origin. Ages ago, the atmosphere of the earth was favorable to the growth of gigantic ferns and plants in marshes and lowlands near the sea. As the leaves and branches of these great plants fell, they formed thick layers of vegetable matter. Later the ground sank, and the sea covered these with layers of sand, mud, and rock. Successive rising and falling of the ground throughout thousands of years resulted in several strata of vegetation and silt. Gradually, under terrific pressure and heat, the vegetation hardened into coal and the silt became rock, so that we now find coal seams with layers of sandstone between them.

Some of these coal seams lie almost horizontally under the surface of the earth while others have been tilted and lie obliquely, because of the upheavals which occurred during the cooling of the earth's surface. Some of the coal seams are several feet in thickness, while others are as thin as a piece of paper. The various stages of the formation of coal are apparent today. Peat is the first stage in coal formation, and anthracite coal, the last stage. In between these two stages, the various kinds of coal are found in the different stages of age and hardness.

The History of Coal. Coal was known to the ancient Greeks, as several of their written records testify. Remains of the Roman camps in England show that the Romans knew and used coal for heating purposes. Travelers during the Middle Ages tell us of the use of coal in China. The monks in England used coal in the ninth century.

It was not until the discovery of steam and the use of coal as a steam fuel that it came into commercial importance. From then on, its importance has increased until today, the commerce and industry of the world is absolutely dependent upon it. Coal first found prominence in England as a steam fuel and England soon forged to the lead in manufacturing because of its coal deposits.

In this country, it was not until the nineteenth century that coal became important. This was because of the presence of great quantities of wood near at hand for heating and steam making purposes. As our population increased, our cities began to grow larger, our forests to recede farther and farther away, and coal yearly became more important to our industrial centers. Today it is our most valuable power resource and furnishes not only the greater part of our power, but also furnishes heat, coke, and illuminating gas, not to mention the many by-products which come from coal tar.

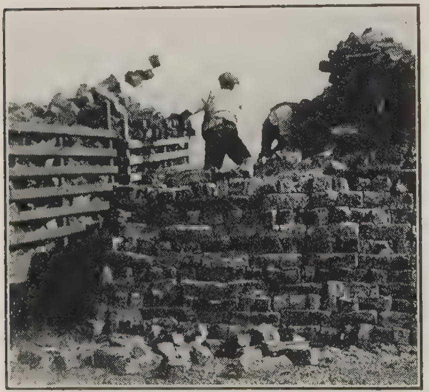

(Keystone View Company, Inc., N. Y.)

FIG. 144. PEAT INDUSTRY, WESTERN IRELAND

Kinds of Coal. The various kinds of coal are caused by difference in age and the previous degrees of pressure and heat to which it has been subjected.

The lowest kind of coal or the first stage in coal formation is peat. Peat is composed of vegetable matter which has piled up in marshes or on low, damp ground and has decayed but little because of lack of air. After being dried, it is used to some extent for heating purposes in regions where it occurs, when other sources of heat are not easily available. It occurs principally in Canada, Ireland, Russia, Germany, and Norway.

Lignite forms a kind of link between peat and real coal.

It is brown or red in color and crumbles easily. It is found in Australasia, central Europe, and in large deposits in our western and southern states. It is used for household heating in the absence of better grades of coal, but as yet has not been important in industry or commerce.

Bituminous coal is often called soft coal. It is the name given to all real coal not classified as anthracite or hard coal. Bituminous coal is the chief coal of industry and commerce, and its deposits are the most widely scattered. It is used for steam making, coke, heating, and gas making.

A special kind of bituminous coal called cannel coal, found in England, is much preferred for open fire places because it burns freely and gives off little smoke.

Anthracitic coal is the hard coal frequently used in heating homes. It occurs only in a few places, principally in Pennsylvania, Nova Scotia, China, and England. It is the most valuable coal found, because it burns with an intense heat and with little flame or smoke.

The Geography of Coal. Because of the lack of adequate surveys, outside of Europe and North America, the coal reserves of the world have not yet been fully determined. Undoubtedly, present and future explorations will disclose the presence of many now unknown coal deposits.

Of the world's known coal reserves, it is estimated that 69% underlie North America; 17%, Asia; 11%, Europe; and 2%, Australia. The great continents of Africa and South America have almost no deposits of commercial importance. Estimates apportion the coal reserves among the following countries: about 52% are in the United States; 17%, in Canada; 14%, in China; and 10%, in all of the western countries of Europe combined. Thus it appears that the great bulk of the known coal reserves of the world are found in the north temperate zone, which explains in part the industrial and commercial supremacy of this part of the world.

The extent of the coal reserves in the various regions does not necessarily determine their coal production. Among the factors that enter into coal production also are: (1) the quality of the coal; (2) its nearness to market and the industrial centers; (3) the ease with which it can be mined; and (4) the character of the people where it is found. The United States is well favored in all these respects and produces about two-fifths of the world's supply. The United Kingdom, with less than 3% of the known coal reserves, produces usually about one-quarter of the world's coal supply. Germany, with about 5% of the coal reserves, supplies about one-fifth of the world's coal production.

Outside of deposits of good quality coal in Nova Scotia and British Columbia, Canada's coal is mostly lignite and enters but little into commerce. Although the estimated coal resources of China are great she produces very little because the mines are undeveloped.

Japan with very small reserves produces more coal than China, about 2% of the production of the world.

The Coal Fields of the United States. The United States Geological Survey gives six main coal fields in our country. The Eastern Field, generally called the Appalachian Field, extends from Ohio and Pennsylvania southward to Alabama. The Interior Field is composed of three distinct sections: the northern section includes Michigan; the eastern section covers Illinois, Indiana, and western Kentucky; and the western section begins in central Iowa and runs southwestward to central Texas. The Gulf Field takes in those southern states that have large deposits of lignite. The Northern Great Plains Field, composed largely of lignite, extends from Montana, North Dakota, and Wyoming, southward to New Mexico. The Rocky Mountain Field includes several disconnected deposits. The Pacific Coast Field finds its chief, and almost only, deposits in Washington.

The best quality coal, including anthracite and high grade steaming coal, is found in the Appalachian Field, and with few exceptions the quality of coal decreases as one goes westward, while the quantity increases. As the eastern deposits become depleted and the price of their coal increases, the immense low grade bituminous and lignite deposits of the western regions will come more into prominence, not only for heating purposes, but also for gas production. At present their commercial value is confined almost wholly to household heating. Pennsylvania, West Virginia, Illinois, Kentucky, and Ohio are our leading coal states.

The Appalachian Field. This coal field has all the factors for a large coal production. In some parts of its northern section in Pennsylvania are found grades of bituminous coal which are famous for their coking qualities, so essential to the iron and steel industry nearby. In eastern Pennsylvania occur the only deposits of consequence of anthracitic coal in the United States. The high grade of coal in the Appalachian Field is particularly valuable because of its nearness to the great industrial centers of the eastern and central sections of our country. They depend upon it to furnish fuel to generate the steam which supplies their transportation facilities and power plants.

(Keystone View Company, Inc., N. Y.)

FIG. 145. MINING COAL, PENNSYLVANIA

In the central section of this field, some difficulty is found in getting the coal to market because of the ruggedness of the topography. In the southern section great quantities of coal are used in the iron and steel industries centered at

Birmingham, Alabama. The comparative ease with which this field can be mined has led to hurried and wasteful methods of mining.

The ingenuity of the American is well illustrated in this field by the large use of mining machinery. This and the nearness of the coal to the surface make the per capita production large and also relatively cheap. The great industries which have made our country famous are possible principally because of this great deposit of excellent coal, near at hand and easily mined. The anthracite from this field heats and warms the houses of New England, the middle Atlantic states, and many of the houses in the north central states.

The Interior Coal Field. The grade of bituminous coal in this field is inferior to that of the Appalachian Field, but is superior to much of the coal of Europe. Because of its nearness to the large industrial centers this deposit is of great importance to the industrial life of the regions where it occurs.

The northern and eastern sections of this field are the most important, because of the quality of their coal and nearness to market. The coal seams in this field are almost level and easily reached. The western section is not extensively mined because the coal there is of low grade and is far from industrial centers. Some of it is used locally, chiefly for heating purposes, and some is used by the railroads.

The presence of petroleum near this deposit has tended to postpone the coal mining until low grade coal has come into more demand.

Coal Mining. There are three general ways in which to mine coal. One is used where the coal seams come to the surface. These seams are mined like stone quarries. If the outcrop is on the side of a hill, the seam into the side of the hill is followed by tunnels.

The second way is used where coal seams are very near the surface. In this case, the top covering of earth is removed by huge steam shovels, and the coal underneath is scooped up and dumped into cars which run into the cut on temporary tracks.

By far the most coal is secured in the third way, where the coal seams are some distance down in the earth. A vertical shaft is sunk to the coal seam and it is worked from the bottom of the shaft. The shaft in this country is generally sunk in a rectangular shape about thirty feet long and twelve feet wide. It is divided into four sections, two for the elevators, one for ventilation, and one for the pumps. Over the top of the shaft is erected what is called the head frame, on which are built the large wheels over which run the steel cables that raise and lower the elevators. These wheels are called sheaves.

(Keystone View Company, Inc., N. Y.)

FIG. 146. ELECTRIC CUTTING MACHINE IN COAL MINE

The power for hoisting is supplied by steam engines, located nearby, which drive huge drums over which the cable is wound or unwound. In the engine house, also, are located powerful pumps which regulate the ventilation, and others which pump out great quantities of water which leak into the mine.

At the foot of the shaft extend passageways, cut out from the coal seams. Following along the coal seams, these passages resemble narrow streets with cross streets and alleys. Some of these passages are used for hauling coal to the elevators and some are used for ventilation and drainage purposes. Everywhere the roof is held up by pillars of coal or stout wooden props. Electric fans keep the air circulating and great care is taken to secure good ventilation. In the deeper mines extra precaution is taken to keep the air as cool and dry as possible.

As we go downward into the earth the temperature and humidity rise until in the very deep mines it is hard for the miners to work. The deepest mines are in Europe. As yet our mines have not reached very great depths.

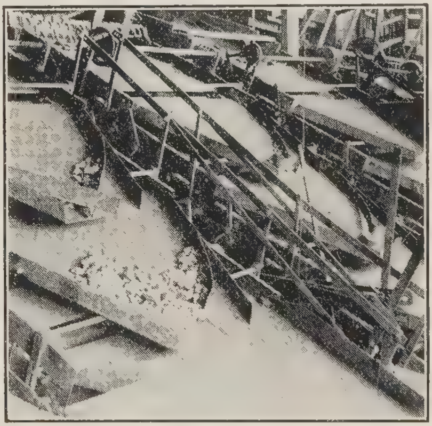
Generally, the coal is cut out of the seams by what is called undercutting. When this is done by hand, it is very hard as the miner has to work almost wholly lying on his side or back. In many mines, mechanical cutters are used, which undercut the coal for several feet. If the coal does not fall, after being undercut, dynamite is used to loosen it.

To the miner is assigned the task of cutting out the coal and loosening it from the seam. The miner's helper takes care of it after that. He attends to the breaking of the coal into small pieces, loading it onto the cars, and removing it from the mine. Because of the exacting nature of the work, most miners work but half a day at a time, getting out enough coal in that time to keep their helpers busy for the day.

The coal is hauled through the mine's passageways in small cars by men, by mules, or by small locomotives generally driven by gasoline or electricity. When the load arrives at the bottom of the shaft, the cars are loaded onto the elevators and hoisted to the surface.

The cars are then dumped on a long inclined chute composed of iron bars set about four inches apart. The small pieces of coal drop through the bars, while the larger ones continue on to the bottom. These are broken up into smaller pieces by a machine called the breaker. The coal is now screened by passing over a series of screens of different size mesh, the smaller pieces dropping through the first holes, which are the smallest, and the larger pieces continuing on down the slope until they reach larger meshes.

The coal is then run along through chutes where breaker boys watch it carefully, picking out stones and pieces of slate with their hands. In some of the larger mines the picking over of the coal is done by machines, depending upon gravity and centrifugal action to sort out the heavier stones and slates from the coal.



(Keystone View Company, Inc., N. Y.)

FIG. 147. MECHANICAL PICKER WHICH SEPARATES SLATE FROM COAL

Where the coal is of poor quality, or where sufficient demand is present, the coal is washed and the coal dust and dirt separated by water action. Much of the dust and smaller pieces of coal, which were formerly wasted at the mines, are now made into coal briquettes by means of some sticky substance which glues them together.

Commerce in Coal. The three great coal exporting countries are England, Germany, and the United States. Almost all other industrial countries are importers from these countries, except Japan and Australia, which export small quantities to nearby seaports and countries. Our export of bituminous coal forms less than 4% of our production, but, because our production is so large, this percent forms a valuable item in our export trade. Over three-quarters of our coal export goes to Canada.

In competing with England and Germany for the European market, we are handicapped by the expense of transportation to the coast, of ocean transportation to the country of destination, and the unfavorable balance of available freight space. Coal is a bulky freight in comparison to its value and the countries nearer the European market can ship coal to that market much more cheaply than we can. Our outgoing freights to Europe are largely bulky raw materials like grain and cotton, while our incoming freights are chiefly manufactured goods, which occupy smaller space. The difficulty of getting return cargoes from Europe is increased when we add coal exports to European bound commerce.

On the other hand, coal shipments to Central America, the West Indies, and South America are more easily accommodated in outbound steamers, because the return cargoes from these regions consist principally of bulky raw materials. The demand for coal in these regions is not large, because they are not industrial and lie mostly in the warm climates. Outside of our exports to Canada, it is doubtful whether our foreign trade in coal will increase.

The United Kingdom, because of her dense population, is a great manufacturing country. Of necessity she must import her food supplies and raw materials. This creates an inbound freightage composed chiefly of bulky materials. In order to furnish the outbound cargoes for her ships she uses coal, and has thus built up a large export trade in coal, not only to the nearby countries in Europe, but to distant lands where she has established coaling stations for the coaling of war vessels and merchant steamers. In this way, coal is a valuable asset to England, furnishing the power for her many factories and outbound cargoes for her merchant ships.

Germany is in somewhat the same position, importing raw materials and exporting small manufactured articles and coal to fill up the cargo space. Germany is favored also by being in the center of a great industrial region, with the manufacturing countries of western Europe nearby, all of which need coal for power.

In the United States the domestic commerce in coal moves westward, as a rule, with the exception of the movement of coal to the Atlantic Coast regions. This westward movement is due primarily to the superiority of the quality of the eastern coal and also because the railroads, after pulling the great crops of the West to the eastern seaboard, can haul coal westward on their return trip. Water transportation down the Ohio River is also easier going west. For these reasons we find much coal from the Appalachian Field finding its way to the industrial centers of the Middle West. It is estimated that the railroads use about 30% of our coal in their locomotives and that about one-third of their freight is coal.

TEXT QUESTIONS

1. How was the coal formed? What is it?
2. Discuss briefly the history of coal.
3. What are the different kinds of coal?
4. Where are located the principal coal reserves?
5. What factors enter into coal production?
6. What countries lead in coal production? Why?
7. Where are our principal coal fields?
8. What can you say of the quality of coal in the east and west of our country?
9. Where in the United States is the largest anthracite bed located?
10. Discuss the coal of the Appalachian Field in regard to quantity and quality.
11. Why is the output per capita greater in this field?
12. Discuss the Interior Coal Field.
13. In what three ways is coal mined?
14. Describe a coal mine underground.
15. Describe mining methods in general.
16. Contrast coal mining in the United States and Europe.
17. How is coal prepared for market?
18. What difficulty in regard to ocean freights handicaps us in competition with England? Explain.
19. Why is it better for us to ship to South America than to Europe?
20. Explain the westward movement of coal in the United States.

SECTION 2—PETROLEUM

The Formation of Petroleum. The way in which petroleum was formed is not so well known as is the formation of coal. It is now generally agreed, that long before the coal-forming period, water that covered the earth was full of fish and a kind of animal called mollusks. Probably, during the great upheavals of the earth that took place, these fish and mollusks were buried at great depths and, under heat and pressure, were distilled into natural gas and petroleum. Wherever there occurred air- and oil-tight chambers in the rocks, this oil and gas collected and have stayed imprisoned for millions of years, awaiting the coming of the oil wells recently driven down to them.

Two things help prove this theory. In the rocks below the petroleum pools are found fossil remains of fish and mollusks. Present day forms of life resembling these ancient ones yield an oil very similar to petroleum when distilled. Of course, wherever the gas and oil have had an opportunity to evaporate because of leaks in the rock formation, the supply has disappeared.

The common experience in petroleum well-drilling is to find chambers in which gas is on top, petroleum next, and at the bottom salty water. It depends upon where the well strikes the chambers as to what will come to the surface. If the well hits the gas, the result is a gas well. If the well hits the petroleum, we get a gusher, the oil being pushed up by the expansion of the gas on top of it. If the well hits water, then we get a water gusher which, after the water has been all pushed up, may be followed by a rush of oil. As the supply of petroleum gets lower in the chamber, the gas has less expansive force and the gusher may cease to spout. The oil must then be pumped up.

The History of Petroleum. Like coal, the presence of petroleum was well known to the ancients, but its extended use is confined to recent years. Many writings testify to the fact that it was known and used some by early peoples. The people of Burmah have used it for centuries to light their houses, getting it from the first known oil wells which were sunk in that region.

During the Middle Ages it was used some in Europe as a medicine. The Indians knew of it long before the coming of the white man to America. They also used it as a medicine, chiefly as a liniment, getting their supply from the oil floating on pools of water. As early as 1635, a French missionary reported its presence in northern Pennsylvania. The early settlers copied the Indians in its use, and petroleum became a popular medicine in those regions where it was found on the surface. This gave rise to a business in collecting and selling it for medicinal purposes under the name of Seneca Oil, named after the tribe of that name.

In 1854, a man by the name of Colonel Drake sank the first oil well in an endeavor to secure a greater quantity of this oil. About the same time it was found that, after distillation into kerosene, petroleum could furnish a very satisfactory light. Its popularity became great in a short time and the drilling of oil wells soon became a booming industry. The oil industry, from 1860 on, spread rapidly, new fields were discovered, and a great business and industry came into being.

The invention of the gasoline engine and the automobile, about 1900, increased the demand for gasoline, and, as this also is a product of petroleum, petroleum became a very important industrial product, until today it ranks well up towards the top in its magnitude and value.

The Geography of Petroleum. The petroleum reserves of the world are widely scattered and have not fully been determined. It is highly probable that for many years to come, new fields will be discovered which will affect greatly the possible world supply. At this time, only rough estimates can be given of what reserves are known and what reserves are probable.

Of the known world's petroleum reserves, it is estimated by the best authorities that our country has about one-fifth, followed in importance by Russia, Persia and Mesopotamia, northern South America, Mexico, southern South America, and the East Indies. Many other countries have oil fields of considerable extent.

The countries that led in petroleum production in 1925 were the United States, with over 70% of the world's production, followed in order by Mexico, Russia, Persia and Mesopotamia, the East Indies, and Venezuela. The last named country has been rapidly forging upwards in relative rank and now promises to become one of the leading producing regions of the world as soon as its transportation facilities have been improved.

The order of importance in world production will shift between various countries as present oil wells decline in output and new regions are opened up, but it appears that for several years we shall probably lead in world production.

Notwithstanding our large domestic use of petroleum and its products, we export more than we import. Most of our exports go to Europe. South America takes most of our gas and fuel oils to generate power. Asia is a good customer for kerosene, which is a valuable illuminant in distant regions far from other sources of light.

Most of our imports of crude oil come from Mexico and Venezuela.

The Oil Fields of the United States. The various oil fields of the United States differ, not only in their location, but also in the quality and type of petroleum produced. The Appalachian Field includes New York, Pennsylvania, Ohio, West Virginia, Kentucky, and Tennessee. This is the oldest field and for many years furnished almost all the oil produced in our country. It reached its highest point of production about 1900 and has since declined in its output. The oil from this field is the best in quality, having a paraffin base and being free from the objectionable presence of asphalt and sulphur.

The Lima-Indiana Field includes northwestern Ohio and Indiana. This is one of the oldest fields and reached its maximum output about 1896, at which time it was a very important field. Its present production is small.

The Illinois Field is located chiefly in the state of that name, with a part in southwest Indiana. This field ranks second in the quality of its oil. It reached its highest point of production about 1908 and now ranks next to the smallest field in production.

The Mid-Continent Field includes Oklahoma, Texas, Kansas, northern Louisiana, and Arkansas. This field now is producing more than all the other fields in the United States combined and its production is increasing yearly, reaching to over 420,000,000 barrels in 1925.

The Gulf Coast Field takes in the regions along the coasts of Texas and Louisiana. In 1905 it reached its highest yield; in 1925 it ranked fourth in quantity.

The Rocky Mountain Field includes Wyoming, Montana, and Colorado. In 1922 it produced its greatest yield; its present position in production is third.

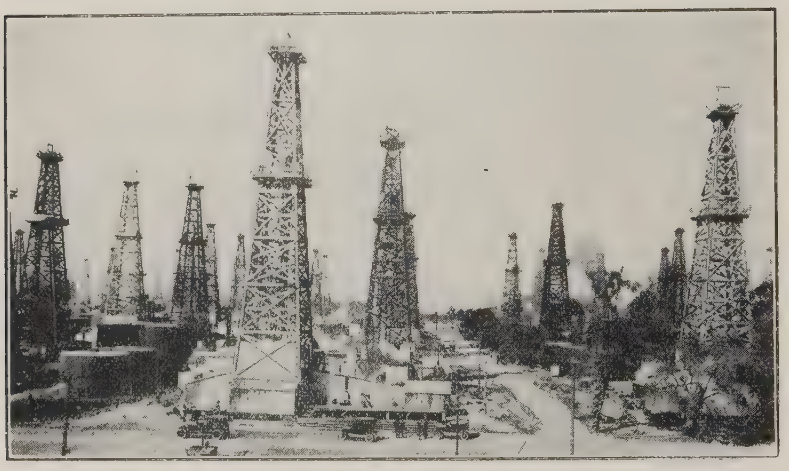
The California Field reached its maximum output in 1923 although in 1925 it ranked second only to the Mid-Continent Field. The quality of its oil is such that it is used chiefly for fuel oils, lubricants, and asphalt. This field is especially important to the industries of the Pacific Coast because it furnishes power fuel which otherwise would be lacking.

In some classifications the Appalachian Field, the Lima-Indiana Field, and the Illinois Field are grouped together as the Eastern Fields. The leading states in petroleum production at present are California, Oklahoma, and Texas.

Locating Oil Wells. Petroleum occurs in large underground chambers or pools, the location and extent of which can not be determined from the surface of the earth. Geologists can tell us where oil may be found, and successful wells tell us where oil has been struck.

Land near an operating well immediately rises in value and is subject to speculation, because promoters rush to secure leases of it in order to sink other wells, hoping to strike the same pool that the successful well has hit. Some of these new wells are successful and strike the same pool, while others miss it entirely because it does not extend under the land where they have been sunk.

The number of dry or unsuccessful wells averages about twenty per cent of those sunk and represents an economic loss. If a well strikes oil, the owners become eager to get all the oil they can as quickly as possible, because the extent of the pool and the amount of oil in it are unknown and rival wells are tapping the same source. This leads to overproduction and great waste.



(Keystone View Company, Inc., N. Y.)

FIG. 148. CALIFORNIA OIL WELLS

Because of the uncertainty of the location of oil chambers underground, and the volume of a pool, the petroleum industry is highly speculative and is the basis of one of the greatest gambling opportunities of the present time. Great fortunes have been made in speculation in land leases and successful wells, but, on the other hand, great losses have occurred.

The Sinking of an Oil Well. When a lease, or title to the surface land, has been secured, a wooden derrick is built, similar in some ways to that of a pile driver. Off to one side is located a rude engine house, in which are placed the engines and devices for drilling. Most wells are made by great drills suspended by cables from wheels in the derrick. They are continually being raised and allowed to fall through the earth and rock formations, their weight driving the hole deeper and deeper.

After every six feet in depth, the drill is hoisted to the surface and a sand pump lowered. This device has a trap door in its bottom which closes when it hits the bottom of the hole. It is then drawn up bringing with it the sand and sediment formed by the drill. The drill is then lowered and operations resumed. These instruments are kept sharp and well pointed by men who make a business of this.

When the drill has gone down into the earth some distance, an iron pipe, generally about six inches in diameter, is rammed down the hole to prevent water and dirt from filling it. This pipe follows the drill downward constantly and forms a tight protection for it.

When the drill breaks through the roof of the oil pool, if it is successful in striking a location where there is a pool, it may break through in the upper part of the chamber and gas will rush up through the pipe and a gas well results. If the drill breaks through lower down, where the petroleum is, the expansion of the gas above it in the chamber will push the petroleum up with great force and a gusher oil well results. Sometimes the drill reaches water first underneath the oil. Then the salt water comes to the surface, being forced up by the pressure of the gas on the petroleum above the water. This gives a gushing water well, which may result later in oil when the water has been lowered in the pool to a point where the petroleum comes to the pipe.

The six-inch pipe is lined with a smaller pipe and between the two is placed some material to make the space oil tight. Sometimes the force of the oil rushing upwards, pushed by the expanding gas below the ground, is so great that it wrecks the drill and derrick and is brought under control only with difficulty. When finally controlled, the pipe is fitted with a hydrant which can regulate the upward flow.

Sometimes explosives are lowered in the wells and set off far down in the earth with the hope that the explosion will break up obstructions down there and allow the oil to reach the lower end of the well. This is called shooting a well and is used only when the well has not been successful in reaching oil or has been exhausted in its flow.

In the sinking of wells, a careless well-driver may run into an underground stream of water which, unless properly stopped, will flood the pool of oil lower down and spoil its productivity, not only for his well, but for all the others which tap the same pool.

When there is not sufficient gas in the chamber to push the oil upwards, pumping must be resorted to and the oil brought to the surface by power. Oftentimes also, an oil gusher will cease to flow because the gas pressure has decreased and again pumping must be used.

Fire is always a constant danger in the oil fields because of the difficulty in putting an oil fire out. Great precautions are taken to prevent fires, caused either by human carelessness or by lightning.

Transportation of Petroleum. The petroleum, upon reaching the surface, is run or pumped into large settling tanks where the dirt and water sink to the bottom. When the oil is cleared of these, it is stored in large storage tanks until ready for transportation to the refineries.

The transportation of oil is unique in that it is handled, almost wholly, by means of pipe lines which have been built all over the oil fields and across great distances to the refineries. These pipe lines are generally built of iron pipe, varying in size, and resemble our water supply systems.

In the trunk pipe lines, which carry the oil from the oil fields hundreds of miles to the refineries and markets, the pipes are usually about six or eight inches in diameter and the oil is pumped along through them by pumping stations located about thirty or forty miles apart. These trunk lines reach from the Mid-continent Field to the Atlantic Coast and to Chicago.

One of the greatest losses in the oil industry is due to evaporation, and great care is now being taken to reduce this to its lowest point.

The railroad tank cars which we often see are used principally to transport gasoline and kerosene from the refineries to the markets. The tank steamers are used to transport either crude or refined oil to distant ports. Tank wagons distribute gasoline and kerosene to the retailers and direct to customers.

Kerosene for foreign trade is generally put up in five gallon tins which prevent evaporation, and these often find various uses, after the kerosene itself has been used, in the distant lands to which they are sent.

The Refining of Petroleum. Crude petroleum, as it comes from the wells to the refineries, is a heavy liquid, dark in color, and with a very disagreeable odor. It contains many impurities. These are separated from it by distillation, which also accomplishes the separation of the various substances found in it, which are in demand for industry.

The petroleum is put into large iron tanks and slowly heated. The various substances pass off in the form of vapor, the more volatile going first under less heat. These vapors pass through pipes which run through cold water, which cools them into liquid form again. After distillation, these liquids are treated chemically to remove impurities which are still in them.

Rhigolene, naphtha, gasoline, benzine, and kerosene result from the distilling process, passing off in the above order as vapor when the crude petroleum is heated. The degree of heat which causes them to vaporize determines their character; kerosene, being the least volatile, passes off last. The degree of heat necessary to vaporize them is now fixed by law so that these products may be safe within certain limits.

If kerosene should contain some parts of the more easily vaporized gasoline or naphtha it would be dangerous to use in our ordinary lamps. To be safe, kerosene should not evaporate at less than 100 degrees Fahrenheit or burst into flame at less than 125 degrees.

Gasoline varies somewhat within certain degrees, depending upon the use to which it is to be put. Naphtha is very dangerous because it explodes and ignites at lower temperatures. It should never be used in a closed room because it is very volatile.

Rhigolene vaporizes so quickly it is used by doctors in operations and also in freezing mixtures.

Uses of Petroleum. Besides the use of crude petroleum for fuel, gas, and power purposes, petroleum is particularly remarkable for the scope and amount of its by-products. What remains in the still, after the volatile products have been distilled, is used to make the hundreds of important by-products which come from petroleum.

Important by-products are rubber, solvents, cleaning fluids, road oils, paraffine products, candles, gum, various drugs, electric carbons, vaseline products, lubricating oils, aniline dyes, and many other important products.

These articles are by-products of the general processes of extracting the more desired gasoline, kerosene and oils, and, in a way, are a conservation of our great petroleum resources. This by-product industry has a big future and already the chemists are busy utilizing every part of the crude petroleum as it passes through the refineries.

A further discussion of the conservation of our petroleum resources is found in the chapter on the use of our power resources.

Natural Gas. Natural gas generally occurs with petroleum, but sometimes it does occur separately. It is one of our most valuable natural resources, yet none has been so carelessly wasted. Formerly much of the natural gas in the oil fields was allowed to escape into the air. Almost anyone could dig a gas well and either use or waste the flow from it. Some wells have been allowed to burn for years. The annual waste in natural gas runs into millions of dollars. More attention is now being paid to its conservation.

Much of the gas found in the oil wells has been piped to industrial concerns which find it an excellent steam maker and a cheap source of power. The iron and glass industries often locate near a supply of natural gas because it forms an ideal fuel for them, being free from sulphur, cheap, and giving a very intense heat. Natural gas is better for heat and poorer for light than manufactured gas.

Much of the natural gas is now being refined into gasoline and this is one of the most important developments of recent years. It is also used to make carbon black. Many of the cities near gas wells use the gas from them in their houses and industrial plants. When a gas well first comes in, it often has a great pressure, but as the gas is used, the pressure decreases until the gas has to be pumped, or the well becomes exhausted.

Like oil fields, gas fields are widely spread over the United States, and as the supply becomes exhausted in the various fields there is a shift in the amount produced and in the relative importance of the different fields.

In the East, West Virginia, Pennsylvania, and Ohio are important producers, while California, Oklahoma, Louisiana lead in the quantity produced at present.

TEXT QUESTIONS

1. How was petroleum formed?
2. Discuss the early history of petroleum up to the time of the discovery of the kerosene lamp.
3. What events stimulated the production of petroleum?
4. Where are the leading regions of oil production?
5. Discuss our imports and exports of oil and its products.
6. Locate the oil fields of the United States in order of their discovery. Which are the most important now?
7. Describe how oil wells are located?
8. How are oil wells sunk? Describe the process.
9. What makes the different kinds of wells? Explain.
10. What are the dangers in sinking oil wells?
11. Explain the different ways in which petroleum and its products are transported.
12. How is petroleum refined into its products?
13. List the uses of petroleum. Its by-products.
14. In what ways is petroleum wasted? How could it be better conserved?
15. Discuss the future supply and demand for oil.
16. Why is the oil industry so speculative in nature? Is this a good thing? Why?

SECTION 3—BUILDING MATERIALS

Cement. Since earliest times, man has used some kind of material as cement to bind rocks and bricks together. In early times, this was probably burnt gypsum. The Romans used a cement similar to our Portland cement, but its secret was lost and it was not until 1824 that an Englishman discovered that limestone and shale ground up fine, heated, and then ground up again would make a cement which, when hardened, would resemble the rock formations found in Portland, England. He called his discovery Portland cement.

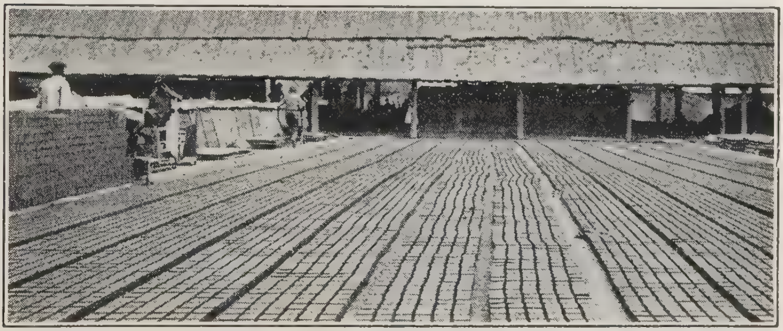
It is only within the last fifty years that this cement has come into wide use and the demand for it is increasing at a very rapid rate at the present time. When this cement is mixed with gravel, sand, and small rocks, and allowed to harden, it makes what is called concrete. This is fast becoming the most practical material for foundation work and road building. Some Portland cement is also made from the slag waste of blast furnaces.

Cement works are generally located as near the markets as possible to avoid excessive freight costs. Eastern Pennsylvania, including the Lehigh Valley, leads in the production of cement in this country.

Clay Products. Primitive man soon learned to mold clay into shapes and harden them in the heat of the sun. Later, using finer grades of clay and more heat from artificial means, he succeeded in making many beautiful and useful things. That the art of the potter was well known among ancient people is proved by the wonderful examples found in ruins. In fact some of our earliest records are on baked clay tablets.

We might classify clay products into two general classes: building materials, such as bricks, terra cotta, tiles, and drain pipes; and utensils, such as dishes and art objects. In the making of all these, four general processes are used: first, the clay is mixed and brought into the right condition for molding; second, the article is molded into the form desired; third, it is dried; and, fourth, it is baked under prolonged and intense heat. A brick and a fragile, dainty dish differ only in the kind of clay and the finishing processes.

In finishing dishes and art objects, a glaze is put on the object, after which the pattern is painted or transferred onto it and a final baking is given. Porcelain has come into great use, being especially valuable in electrical equipment as a non-conductor. Most of our bathroom fixtures are iron, coated with porcelain, and many of our kitchen utensils are made the same way.



(Photograph by Ewing Galloway, N. Y.)

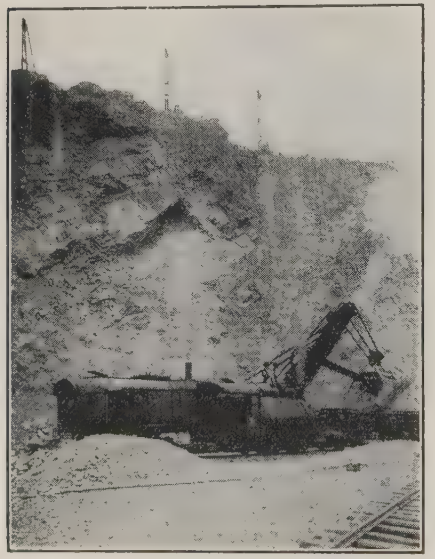
FIG. 149. DRYING BRICK IN THE SUN

Building materials are generally made as near to the market as the location of clay permits, because of their heavy freight costs. The large clay beds of New Jersey and the Hudson Valley are so used to furnish enormous amounts of building materials to New York City.

In the making of fine dishes, the quality of the clay plays a very important part so it is sometimes imported from great distances. Trenton, New Jersey, and East Liverpool, Ohio, are the leading pottery centers in the United States.

Building Stone. From earliest times man has used stone chiefly as a material to build dwellings. In the older countries of Europe, almost all construction is of stone, because of the lack of cheap wood. In this country, much of our construction has been of wood because of the bountiful supply of cheap lumber. With the rapidly advancing costs of wood, we are gradually turning to the more lasting and durable qualities of stone construction. Stone also has the advantage of being fireproof and in our large cities new construction jobs are required to be built of stone or other fireproof material. A comparison between the fire loss of Europe and the United States shows the benefits of stone construction.

Over half of the rock used in this country is now being used in the form of crushed rock. Crushed rock is used in large construction jobs for mixing with cement to form concrete; in road making, of which there has been a large increase; as ballast for railroad tracks; and also in the chemical industry. This enormous use of crushed rock utilizes much of the smaller rocks which formerly were wasted. Many quarries of larger building stone, having become exhausted for large size stone, are now turning to the crushed rock and paving stone industry to use their small pieces, which were thrown out as unusable in former times.



(Keystone View Company, Inc., N. Y.)

FIG. 150. QUARRYING BROKEN ROCK FOR ROAD BEDS

The principal stones used for building material are granite, sandstone, limestone, marble and slate. Granite occurs in widely scattered places over the country and, when possible, is mined locally to save freight costs. Because granite is hard and weather resisting, and also because it takes a high polish, it is much used not only for building material, but also for monuments.

New England leads in granite production. In some cases the quarries, especially those of Maine and Massachusetts, are so located that water transportation is near, which greatly reduces the transportation costs. California is also a large granite producer, principally in the form of crushed stone.

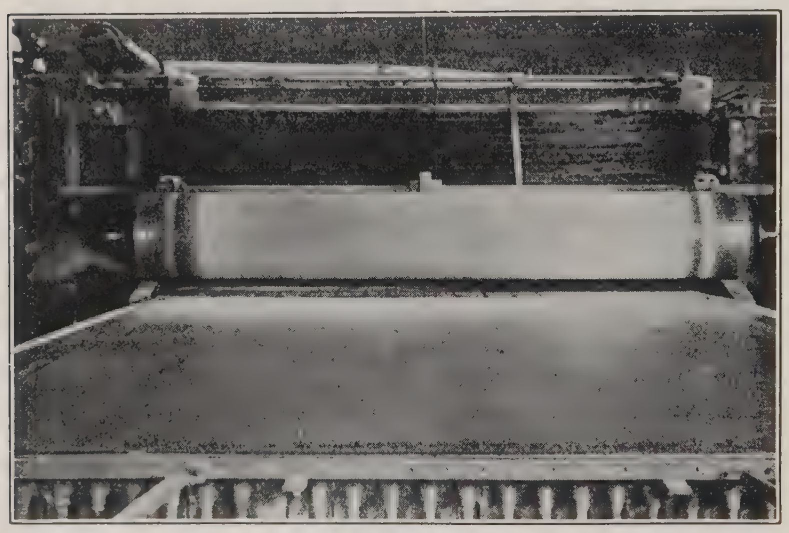
Sandstones are also widely distributed. This stone is made up of tiny particles of sand, cemented together centuries ago, and in some colors makes a very pretty stone. Most of the supply of this stone comes from the northeastern part of the United States. The Berea sandstone of Ohio is in great demand. Some of the sandstone of New York is very hard and makes excellent paving stone.

Limestone is the most used of all building stone. The quality of limestone varies with its composition, some being too soft for good construction purposes. While there are limestone quarries in various parts of the country, the Bedford limestone of Indiana is the most sought after for building stone. Much of our limestone is used in the form of crushed rock, and as flux in iron smelting. The amount of limestone used is greater than that of all other varieties put together.

Marble is used in construction, particularly for its beauty. It is the favorite stone of the sculptor and is also much used in monumental work. Ages ago, when it was formed, other materials were mixed with it and it sometimes is found with very beautiful colors and variegated patterns. Often a thin sheet of marble covers the walls of buildings, giving the appearance of solid marble. Vermont, Massachusetts, New York, Georgia, and Tennessee are the leading producers in the east, and California and Colorado in the west. The finest marble in the world comes from Italy.

Slate is clay, hardened by heat and pressure in far off geological times. It has a natural cleavage and great sheets are split off and then shaped to the desired size. Sometimes the slate is dyed to make it even in color. Most of the blackboards in school are made of slate. Slate is also used for sinks, roofs, mantels, floors and other building purposes. It is quarried along the eastern coast from Maine southward to Georgia. Most of our commercial slate comes from Maine and Pennsylvania.

Glass. The ancient Egyptians have left behind them examples and records of glass making that prove it was a well known art early in history. Later the Romans and Greeks knew and used glass. During the Dark Ages the Venetians secured the lead in glass making and held it for centuries.



(Keystone View Company, Inc., N. Y.)

FIG. 151. PLATE GLASS COOLING AFTER BEING ROLLED

In this country, while there were a few scattered glass factories in colonial times, it is not until after the Revolution that we find permanently established factories. The East retained its leadership for some time, but with the use of coal, natural gas, and later petroleum, for heating agents, the industry spread. Pittsburgh is the leading city now.

Glass is made by heating sand with flux materials like soda, potash, and salt. As the sand is heated at high temperatures it becomes liquid, and when hardened is glass. Ordinary window glass is made by glass blowers who blow the molten glass into large cylinders which are then cut, flattened down, and shaped into window glass sizes. Plate glass is molded in large, flat molds from the melted glass, then smoothed down by large rollers, ground into the right thickness by rough wheels, and finally polished.

Bottles are blown into molds while the glass is still soft or pressed into molds by machines. Cut glass is a specially mixed glass that has been cut with special devices which make the designs. The imitation cut glass is made by pressing soft glass into molds.

TEXT QUESTIONS

1. Why was not cement used more in colonial times?
2. Why is it called "Portland" cement?
3. From what materials is our common cement made? How?
4. Why is it desirable to make cement near large cities?
5. Prove that the art of making clay vessels was well known in ancient times.
6. Give the four processes in making clay products.

7. How is porcelain used? Why is it in such demand?
8. Where are clay building materials usually made? Why?
9. Locate our most important pottery centers.
10. Explain the growing use of stone in buildings in the United States.
11. For what are the greatest amounts of stone used?
12. Name the principal building stones.
13. Locate the leading centers of the stone production.
14. How is most of the limestone in our country used?
15. Why is limestone so important to the iron and steel industry?
16. What is marble used for? Where is the best quarried?
17. Why is it desirable to have water transportation for stone materials when possible?
18. What is slate? How used?
19. Show that glass making is an old art.
20. Describe the various kinds of glass, their uses, and the methods used in their manufacture.

SECTION 4—MISCELLANEOUS

Fertilizers. By continual cropping of the land and carrying away the crop, man gradually impoverishes the soil and eventually exhausts it. Increased production can be brought about by opening up new lands or by returning to the soil some of the plant foods extracted by agriculture. The most important plant foods that are robbed from the soil are phosphorus, potassium and nitrogen. In one form or another, these appear in all prepared fertilizers for restoring the fertility of the soil. The United States is rich only in the phosphates which supply phosphorus, and is obliged to import the nitrates which give us nitrogen and the potash which supplies the potassium.

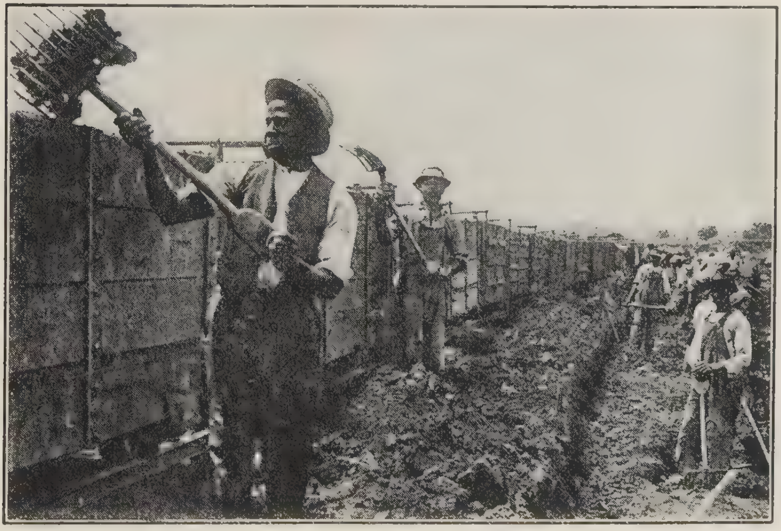
The fertilizer industry is located on our eastern coasts because here it is easier to secure the bulky raw materials from their sources, either domestic or foreign, and the eastern farm lands are the ones which form the principal market for fertilizers, being the older and more impoverished, therefore needing it the most.

The Nitrates. The nitrogen of commercial fertilizers is obtained from the large beds of nitrates in Chile, from the refuse of meat packing and fish canning factories, from garbage, from ammonia which is a by-product of the coke industry, and from the air itself. While there are a few scattering deposits of nitrates in some of our dry western states, the great bulk of our nitrate supply comes from South America.

Success in securing nitrogen from the air is an accomplished fact and requires great and cheap electrical power. The great Muscle Shoals Power Plant is expected to give us cheap nitrates from the air.

Potash. The potassium of commercial fertilizers comes mostly from deposits of potash. The largest of these deposits is in Germany, which now furnishes over 80% of the potash supply of the world. There is also a deposit in Alsace. During the World War our supply of German potash was cut off and, in this emergency, we were forced to develop the production of potash in this country.

Potash was secured from the salt lakes in Utah, California, and Nebraska. Potash was also made from the sea weed kelp along our sea shores. A large deposit of potash was found deep under the surface in Texas. After the war, however, Germany again gained practically the monopoly in this product because of the cheapness with which she could supply it in competition with other sources.



(Keystone View Company, Inc., N. Y.)

FIG. 152. LOADING PHOSPHATE ON FREIGHT CARS

The Phosphates. The phosphorous in commercial fertilizers comes from the various phosphates. These occur in fossil rock formations, in the bones of slaughtered animals, and in the basic slag from the blast furnaces. By far the greater amount comes from the phosphate rocks which are found in Florida, Tennessee, and in some western states. Florida supplies over 40% of the world's supply and more than twice as much as all other states together.

Europe obtains some of her phosphates from deposits in Africa and also from basic slag. So rich are we in phosphates that we have sufficient for our domestic demands and export heavily to Europe.

Salt. Salt has always been a valuable mineral because it is a necessity to us. Down through the centuries it has been an article of commerce. Fortunately for the human race, it occurs in abundance and is comparatively easy to get. Some is mined under the ground and, after being purified, is ready for market. Some is secured by evaporating sea water.

In our country a large part of the supply is secured by sinking wells, similar to oil wells. Down these wells, fresh water is poured and then, after the salt has dissolved in the water, it is pumped up and the brine evaporated. Not only is salt valuable as a food product, but it is also used extensively in manufacturing, in dairying, and also as a preservative. Large salt works are found in this country in New York State, Michigan, Ohio, California and Utah.

Graphite. Graphite is also known as plumbago and black lead. It is a form of carbon. It is used as a lubricant, in making crucibles, in stove polish, in glazing powders, in paints, in lead pencils, for shot, for electrical purposes, and for foundry linings.

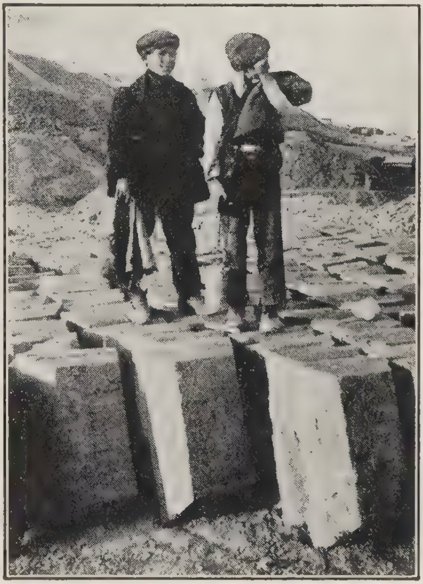
Formerly lead pencils were made from lead, but graphite has displaced it. Graphite for lead pencils must be free from impurities and grit, and must be soft. It is mixed with clay and baked to get the proper degree of hardness. Crucibles are made in the same way. Graphite occurs widely scattered over the earth and in our country.

A large amount of the ordinary grade of graphite comes from Ceylon. New York and Pennsylvania lead in production in this country. Graphite, of high grade and suitable for lead pencils, comes from Siberia. Artificial graphite, of a very high grade, is made at Niagara Falls and is considered the best for lead pencils.

Sulphur. Sulphur occurs in a natural state in Europe, Japan, South America, and the United States. For many years Sicily was the chief producer of the world, but the leadership has passed to the United States, where Louisiana and Texas furnish more than 80% of the supply of the world at present.

In Sicily the sulphur ore is heated to a point where the pure sulphur runs out and is hardened into lumps. In Louisiana and Texas the deposits underground are reached by sunk wells, into which are pumped hot water and steam, which melt the sulphur and force it to the surface under pressure. Here it is reduced to a solid again by evaporation and cooling.

Sulphur is used as a disinfectant, for matches, for gun powder, as a bleaching agent, in the rubber industry, and in the paper pulp industry which uses the greater amount of sulphur produced.



(Keystone View Company, Inc., N. Y.)

FIG. 153. SULPHUR PARTIALLY REFINED IN SICILY

TEXT QUESTIONS

1. What are the names of the food properties of plants that are the most robbed from the soil?
2. In what one are we rich? What ones do we lack?
3. Why is the fertilizer business located near the coast?
4. Describe the sources of nitrates.
5. What are our sources of potash?
6. Where do we get our phosphates from?
7. Discuss exports and imports of nitrates, potash, and phosphates.

8. How is salt secured? Where is it found in commercial quantities?
9. Describe how salt is secured in Louisiana and New York.
10. What is graphite? What used for? Where found? Where made?
11. What is sulphur? Where found? What used for? How secured?
12. What industry depends much on sulphur?

PROBLEMS AND PROJECTS

1. Make an outline map of the United States locating the principal coal fields.
2. List the ways in which coal is wasted and suggest a remedy for each.
3. Secure samples of the various grades and kinds of coals and be able to tell what each is used for.
4. Make a list of the sizes of hard or anthracite coal? What is each size best suited for?
5. Where is the nearest commercial coal field to your locality? Does your local supply come from there? Why?
6. How can you conserve coal in the heating of your house?
7. Why are the smallest pieces of hard coal the cheapest?
8. Collect pictures of coal.
9. Collect stories of the first coal used in the world. In the United States.
10. How are coal briquettes made? Why are they used?
11. List as many by-products of coal as possible.
12. Compare coal and coke as heating agents.
13. Make an outline map of the world showing oil fields. Do the same of the United States.
14. Collect pictures showing oil fields, wells, pipe lines, etc.
15. What kind of gasoline does your father use in his automobile? Why? What kind of lubricating oil is the best? Why?
16. List as many by-products of petroleum as you can. What ones are in common use in your community?

17. How would a complete exhaustion of the petroleum supply affect your life? What articles would you have to do without?
18. How is the price of gasoline regulated? Explain.
19. Explain how oil is used for heating purposes.
20. Explain how a gasoline engine works.
21. Explain how a Diesel engine works.
22. What is hydraulic cement? Why is Portland cement so called?
23. Describe other articles used to hold bricks and stones together. What is lime mortar? How made? What is plaster of Paris? How used?
24. Explain how bricks are made.
25. Explain how fine chinaware is made.
26. Of what are the buildings in the nearest large center to you made?
27. Explain how roads are made from crushed stone.
28. How is crushed rock used in your vicinity? List uses.
29. Describe how concretes are made. What used for?
30. What stone is used in your vicinity most for building purposes? Why?
31. What large buildings are made of stone in your vicinity?
32. Why are most of the buildings in Europe made of stone?
33. Describe each of the principal building stones, giving its advantages and disadvantages.
34. Why is water used for slow transportation of heavy building materials?
35. Describe how limestone is used as a flux in iron smelting.
36. What articles in common use about you are made of slate?
37. Estimate the amount of square feet of glass used in building your house. Your schoolhouse.
38. Collect samples of various kinds of glass. What is each kind used for? How made?
39. Show how the World War made a shortage of potash for us.

40. Examine bags of fertilizer and find out their composition.
41. What kinds of fertilizers are used mostly in the soil near you? Why?
42. How does nature provide salt for animals?
43. How is salt used in industry?
44. Why is salt cheap?

TOPICS

1. The social conditions in the coal regions.
2. The miners' side of the coal strike.
3. The mine operators' side in the coal strike.
4. The coal mining situation in England today.
5. Mechanical coal stokers and their operation.
6. Petroleum fields in Asia Minor.
7. The speculative features in oil production.
8. The Standard Oil Company—its history.
9. Wastes in oil production.
10. Refineries and refining processes.
11. The influence of the good roads movement on cement production.
12. Crushed rock industry.
13. The building stone industry.
14. Clay products—past and present.
15. The need of cheap fertilizers.

FOR CLASS DISCUSSION

1. The last coal strike was justifiable.
2. As a national resource our coal reserves are more important than our petroleum reserves.
3. Competition in gasoline filling stations is beneficial.
4. The petroleum industry and the public would benefit if the petroleum industry were controlled by one big company.
5. The government should own and control our coal mines and oil wells.
6. Good roads pay in the long run.

CHAPTER XXI

METALLIC MINERALS

SECTION 1—IRON

The History of Iron. Few iron articles are found in ruins of olden times, but this does not prove that the use of iron was unknown to the ancients. Iron rusts away when exposed to the air, even in dry climates, which accounts for the scarcity of iron articles in ruins. That iron goes away back to the period preceding written history is proved by the many references to it in our first written records, showing that it was in common use. The Bible refers to iron often, pointing to its common use by the ancient Hebrews. Early in Genesis reference is made to Tubal-cain, an artificer in iron and brass.

A few iron articles have been found in the ruins of Nineveh and in the Pyramids. Herodotus tells us that iron was used in the construction of the Pyramids. Other Greek and Roman writers attest the use of iron in early days. Great cinder heaps were left in England by the Romans in their crude methods of iron manufacture. There were demands for iron and steel armor and weapons during all ages. At the time of the Crusades the smiths of the Italian cities grew prosperous by furnishing supplies to the Crusaders. The steel blades of Damascus and Toledo were famous in their times. Iron has been known for centuries in China and India.

While the production of iron and steel has been carried on in limited quantities down through the centuries, it was not until the invention of steam increased the industrial demand for iron and machinery that their production became so important. The amount of iron produced during the last century makes its total production up to that time seem negligible in comparison. We are now living in what might be called the Iron Age. The prosperity of a region may well be gauged by its demand for iron and its products.

Growth of the Iron Industry in the United States. The native Indians of America evidently did not know the use of iron until the advent of the Europeans. In 1585, records show that the colony of Sir Walter Raleigh on Roanoke Island first discovered iron ore. As early as 1608 some iron ore was shipped to England from Virginia.

The first iron works were established in Lynn, Massachusetts, in 1643 by Governor Winthrop, the iron ore being secured from the banks of ponds and rivers nearby. This foundry prospered and later others sprang up in other colonies. England, in order to benefit her ironmasters at home, greatly hindered the manufacture of iron by restrictive laws, limiting the output in America chiefly to pig iron, except in a few plants where some finished products continued to be made.

After the Revolutionary War the iron and steel industry began to expand more rapidly and many small local foundries sprang into being, using charcoal principally as a heating agent. From 1844, because of the use of hard coal, we find a concentration of iron making in the anthracite coal fields of eastern Pennsylvania, followed soon after by the centering of the industry near the coke fields of western Pennsylvania, due to the change from hard coal to coke as a reducing agent. This district held the lead in iron and steel making for many years, even when ores of the Lake Superior region began to be the principal basis of iron and steel, because it was cheaper to bring the ore to the coal and coke fields of Pennsylvania than to take the coal to the ore.

Gradually the iron industry has spread westward and northward to the lake shore cities where the ore and coal meet. Birmingham, Alabama, has also become a center for this industry, being especially favored by the presence of iron ore, coal, and limestone.

Iron Ores. Iron is found in a pure metallic state only in meteorites which have fallen from the skies. It occurs in many combinations with other minerals and rocks, and often gives to the soil a red, yellow and brown color. When found in combination with other substances, it is called iron ore.

Iron is soluble in water and many tiny particles are washed from the rocks and soil by the action of water and are later dropped in large deposits by gravity or by coming into contact with other substances such as lime. These iron deposits have gradually grown through the centuries until now they reach immense dimensions.

In some deposits the proportion of iron runs as high as 70% while in others the quantity of iron present is small. Most of our iron ores in this country run between 50% and 60% in iron content. Less than 25% of iron in a deposit makes it unprofitable to mine. To be profitable, an iron deposit should contain: a great proportion of iron in its ore; should be near the market; should be near to coal and limestone, which are required to reduce the iron ore to iron; and should not contain too high a proportion of objectionable substances such as sulphur and phosphorus, which add greatly to the cost of reducing the ore.

The principal iron ores of commerce are red hematite, which furnishes the largest proportion of our iron; magnetite, which ranks next and is interesting because of its magnetic qualities; brown hematite; the carbonates; and spiegeleisen. The quality of iron ore, based chiefly upon its iron content and the presence of certain other substances, determines in large part the method of its subsequent treatment in reducing it to the iron and steel required. Great strides have been made in smelting methods so that now many kinds of iron ore are available for use.

The Geography of Iron Ore Production. The extent of the iron ore reserves of the world is very difficult to estimate because of the lack of reliable information. We know that iron ore is widely distributed and that there are vast deposits, the existence of which is known but the extent of which can not even be estimated with any degree of accuracy. Explorers are constantly discovering new supplies.

Conservative estimates of our known deposits tell us that there is enough iron ore to last for hundreds of years at the present rate of consumption. According to the best estimates, the leading ore deposits now lie in the United States, France, northern Sweden, Cuba, Newfoundland, and Brazil. Many of these resources are not being mined, because of lack of coal nearby and the long distance to the market.

The regions that lead in actual ore production are the United States, with over half of the entire world supply, the United Kingdom, France, Germany, Sweden, and Spain. The last two countries are chiefly exporters to countries with a more liberal supply of coal.

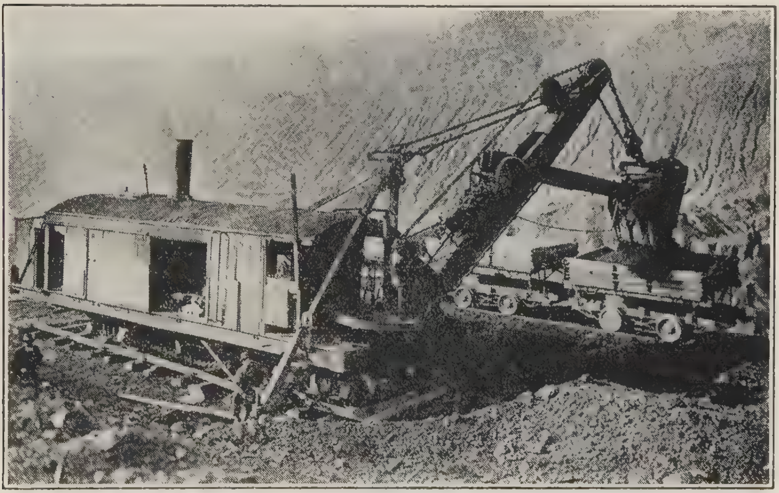
In the United States there are two important iron ore regions. The Lake Superior region, including the states of Minnesota, Michigan, and Wisconsin, is the leading ore region, not only of our country, but of the entire world. It produces over 80% of our domestic production. Minnesota alone leads all our other states combined with over 60% of our whole supply, followed by Michigan which holds second place in quantity mined.

The second region is located in the Appalachian Mountains, running northward from Alabama, which state produces over 8% of our supply and ranks third among the states, to Pennsylvania, New Jersey, and New York. New York and New Jersey now furnish comparatively small percentages of the national production.

Methods of Mining Iron Ore. Iron ore is mined in three ways. In Europe and in some places in this country where the iron ore is deep underground, the shaft method is used. This resembles the shaft mining of coal except that some dangers of coal mining, due to gas, are absent.

In the Lake Superior ore region, where the ore lies near the surface, the open pit method is used. In this method the surface earth is removed by steam shovels. These shovels load the dirt into cars, which carry it away to be dumped. Then large shelves are cut into the ore bed and these same steam shovels scoop up the iron ore in huge clamshell buckets and drop it into the waiting cars, which have been run down to the shovels on temporary tracks. The work continues night and day and huge loads of this surface ore daily move out of the open ore pit onto the regular railroad and then down to the lake shore.

In the milling method the top surface layer of earth is removed and then tunnels run in under the ore beds. The miners shovel the ore down through large openings into the ore cars below in the tunnel, the cars, when full, being pulled out through the underground tunnels to the grade of the regular railroad.

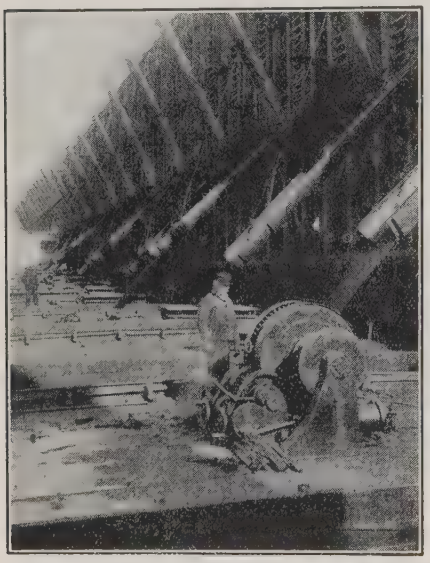


(Photograph by Ewing Galloway, N. Y.)

FIG. 154. MINING IRON ORE WITH STEAM SHOVEL, NORTHERN MINNESOTA

The method of mining used depends upon the depth at which the ore is found and the nature of the ore itself. Open pit and milling methods are preferred by engineers because they are safer and easier to control. They require a large initial capital because of the expense of machinery and maintenance, but are cheaper in the long run where the ore is near the surface. Shaft mining is necessary where the iron ore is too deep to make possible stripping off the surface earth economically. Because the ores of the lake district lend themselves so well to open pit mining, they are used extensively.

Transportation of Iron Ore. Efficient and relatively cheap transportation is necessary for successful iron ore production. In the United States we have been fortunate in the location of our best iron ore deposits, because they are so located that our Great Lakes form a natural highway for bringing the ore to the coal. As fast as the ore cars are loaded in the open pits, they are run down to the lake shore, mostly down grade as the mines are located well above lake level.



(*Keystone View Company, Inc., N. Y.*)

FIG. 155. LOADING ORE SHIP AT DULUTH

At the ports of Duluth and Two Harbors are built great ore piers which stretch far out into the lake. On these piers are the most modern devices for handling the ore by machinery. The ore is dumped into large pockets. The ore boats, built especially for carrying ore, are loaded by chutes, down which the ore is drawn by gravity from the pockets, and in a short time an ore boat carrying thousands of tons of ore is filled. These boats then carry the ore down through the Soo Canals to lake ports in Wisconsin, Indiana, Illinois, Ohio, and Pennsylvania, where the boats are emptied by giant unloading cranes.

The ore is then reloaded into canal boats, or ore cars, to be taken further inland to the cities where it is smelted into pig iron. Often these iron and steel plants are located on the lake shore and the coal is brought from the mines to them. Great attention is paid to loading and unloading by machinery, so that human labor is almost eliminated and this costly item reduced to its lowest possible terms. Water transportation is used in preference to railroad because of its relative cheapness. This accounts for the large volume of ore and coal traffic on our Great Lakes, Ohio River, and connecting canals.

Foreign ores from Newfoundland, Sweden, and Cuba can often be brought to our eastern cities by ocean transportation so cheaply that they can sometimes compete in the iron and steel industry with the inland cities. Using the coke of a gas company that supplies the gas for Boston, a blast furnace located in Everett, Massachusetts, is smelting pig iron from foreign ores and underselling the pig iron from the inland cities. It is because of the costly railroad journey to the coast that this industry remains a domestic one and contributes such a small percentage to foreign trade.

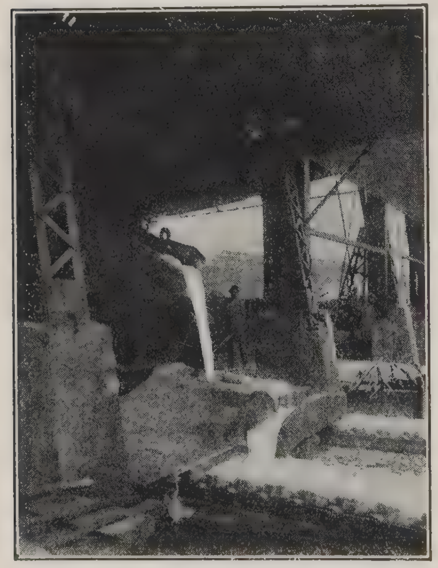
Location of the Iron and Steel Industry. The iron and steel making industry is located in countries where the following factors favor production: (1) abundance of smelting materials such as coal and limestone; (2) abundance of labor; (3) nearness to markets; (4) good and cheap transportation facilities; (5) the presence of sufficient capital to maintain large plants; and (6) easy access to iron ore.

Since 1894 the United States has held the lead in iron and steel production, furnishing as much pig iron as all the rest of the world combined. The other leading countries in iron and steel production are Germany, the United Kingdom, France, Belgium, and Luxemburg. The combined production of these countries is about 85% of the world's production, the remaining 15% being scattered in small amounts among several countries. The iron and steel produced in Asia, Africa, Australia, and South America, combined, are less than that produced in our one city of Pittsburgh.

In the United States, iron and steel plants are found chiefly in Pennsylvania, in states that border the Great Lakes, and in Alabama. For years, Pennsylvania has led all the other states because of her great wealth in good coking, bituminous coal and the presence of limestone near at hand.

There has been a tendency in recent years to locate new iron and steel foundries along the shores of the Great Lakes where the ore is unloaded from the ships from the Lake Superior ore regions, bringing the coal and limestone to meet it there. This industry has also been growing rapidly in recent years around Birmingham, Alabama.

Iron Smelting. All iron ore is smelted, or reduced to pig iron, in blast furnaces. These blast furnaces are huge, vertical cylinders, about twenty feet in diameter at the bottom, lined with several feet of fire bricks and bound with iron plates. At the top, eighty to one hundred feet from the ground, are devices which make it possible to feed into the furnace the materials used in smelting, and also to prevent the gases from escaping. These gases escape through pipes near the top and are used for heating and power purposes.



(Keystone View Company, Inc., N. Y.)

FIG. 156. RUNNING MOLTEN IRON INTO MOLDS

At the bottom of the furnace is the hearth where the molten iron collects. A few feet up are placed large pipes which provide a forced draft of superheated air to burn the coke at a high temperature. Small cars loaded with coke, limestone, or ore run up a steeply inclined track to the top of the furnace, where they are dumped into feeding devices. Loads of these cars are carefully weighed and checked to insure a proper combination of the smelting materials. Some blast furnaces use two thousand tons of raw material and yield two hundred tons of pig iron daily.

Coke is used to generate the heat under forced draught; the limestone fluxes the impurities and together they form slag, which floats on the molten iron because iron is heavier.

When sufficient iron has accumulated in the hearth at the bottom, the slag is first drawn off through a special opening and run out into waiting ladles mounted on wheels. It is then cooled, and later broken up, crushed, and used for cement, road making, and fertilizer.

The iron is drawn off through a special opening at the bottom after the clay plug has been broken. It runs down through a sand channel to moulds made in the sand. These moulds branch off the main channels, and the iron, when cooled, is called pig iron because of the resemblance of the mould pattern to a litter of pigs.

In the larger plants the white hot liquid iron is run into large ladles on wheels and then poured from them into moulds on a long, endless chain, where it is cooled by a shower bath of water.

In case steel is to be made in the same plant, these ladles are run to a great bowl, called the mixer, into which several ladles are poured to form one mixture for later treatment.

The air that furnishes the forced draught in the blast furnace is superheated by the gases drawn from the blast furnace to 1200 degrees Fahrenheit in several large "stoves" which resemble high, round, enclosed smokestacks. The blast furnaces are kept in constant operation day and night until they are burnt out, need repairing, or possibly rebuilding. About five casts a day are generally drawn off from the blast furnace.

Pig iron is the basis of the iron industry. From it are made other kinds of iron. Cast iron is pig iron remelted to a liquid state and then cast in moulds into the shapes desired. It is brittle, hard, breaks easily, and can not be worked by forging, welding, or bending.

Wrought iron is pig iron from which remaining impurities have been taken. Because of its qualities it can be bent, forged, welded, hammered, and drawn out into wire, sheets, bars, and other desirable forms.

Steel is purified pig iron from which certain impurities have been taken and to which other substances have been added. It lends itself to all forms of handling. Because of its strength and the quality of being easily rolled and milled, it is the most highly used form of iron.

Changing Iron into Steel. Modern industry demands not only great quantities, but also many grades and kinds of steel. Five methods of making steel may be distinguished.

The cementation process consists of first making wrought iron by putting the pig iron into a long, low furnace and constantly stirring or puddling the melted iron until most of the carbon is burnt out of it. The wrought iron is then mixed with charcoal and kept hot for a few days until the iron has slowly absorbed the carbon from the charcoal. This was the first method used and was the only one for centuries.

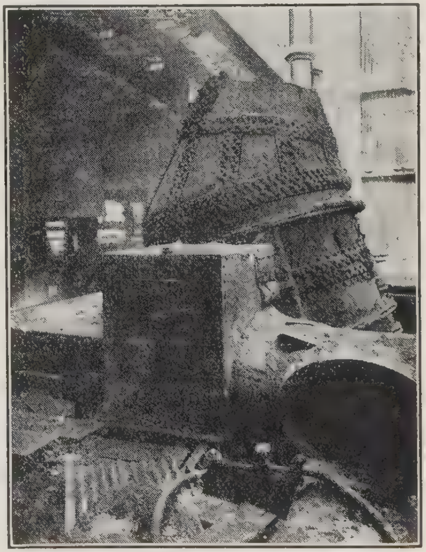
In the crucible method, the wrought iron is placed in large clay crucibles and the carbon added to it in the form of powdered charcoal, or some other form of pure carbon. This gives a very hard steel, fairly uniform in quality, and much used in the manufacture of high-grade hardware, instruments, knives and springs.

In the electric furnace method, the steel resulting is of the highest grade, because the control of the process is so perfect. This method is costly but gives excellent results, especially in the alloy steel, such as nickel, vanadium, and chrome. As electric power becomes cheaper, this process is bound to become more important because of the superiority of its product.

The above three methods, while producing steel of excellent quality, are too costly for the production of the quantity demanded by our industries so we look to the Bessemer process and the open hearth process for the great bulk of our industrial steels.

The Bessemer process is so called after the name of its inventor, Sir Henry Bessemer, who discovered it about 1860. In this process, the melted iron is poured into a huge pear-shaped container called a converter. Air is forced up through the melted iron from holes in the bottom of the converter. The oxygen of the air burns out the impurities and leaves almost pure iron. To this is added spiegeleisen, or a mixture containing the exact amount of carbon and other substance desired in the steel, and the steel is then poured out of the converter by tilting slowly on its side.

This molten steel is either run into moulds and allowed to harden into steel ingots which are later rolled and milled into wrought steel products, or it is cast into special moulds and allowed to cool in the exact form wanted, as cast steel. This process resulted in a much cheaper steel and made possible the use of steel in rails, steel plates, and structural work.



(Keystone View Company, Inc., N. Y.)

FIG. 157. BESSEMER CONVERTER

As Bessemer steel is not regular in its quality, it sometimes breaks under strain and this led to the perfection of the open hearth process. In this process, the iron is melted in long, low furnaces by allowing gas flames to burn over it for several hours, in this way getting rid of the impurities and undesirable substances. By careful watching, the exact content of the melted mass can be determined. When a point has been reached where there is the proper amount of carbon, the melted mass is drawn off through an opening into waiting pots and cast into ingots, or cast steel products. Because the open hearth process can be better controlled and gives steel of more uniform grade, it has fast displaced the Bessemer process.

Commerce in Iron and Steel. We may divide the countries importing iron and steel into three general groups: (1) countries like those of South America and the East Indies, where there is almost no local production; (2) countries like Canada and Japan where the growing demands are not met by the domestic supply; and (3) countries like Germany and the United Kingdom who are also great producers.

The United States ranks fifth among the exporting countries of the world, although she furnishes more than half of the entire world production. This export trade of the United States forms only about 5% of our entire production. This is caused by a large domestic demand at home, transportation costs, and the competition of the European producers. By far the larger proportion of our exports go to countries in North and South America, Canada, alone taking about one-third of it, followed by Cuba, Mexico, and the South American countries with whom our trade is increasing.

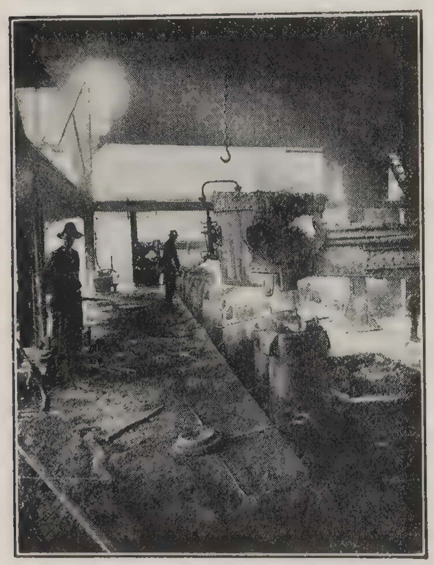

(*Keystone View Company, Inc., N. Y.*)

FIG. 158. POURING MOLTEN STEEL INTO MOLDS FROM LADLE AT THE BESSEMER CONVERTER

Our trade with European countries is large in volume although low in per cent of production. Italy has shown increased trade recently with us. Japan ranks third among the countries, although her trade is decreasing yearly. France is the greatest exporting country of the world at present, followed closely by England and then by Germany. Belgium and Luxemburg are important exporters in proportion to their production.

We import some iron ore from Newfoundland, Sweden, Cuba, and Brazil. Most of our imports of iron and steel are composed of pig iron, alloys, and crude steel.

TEXT QUESTIONS

1. Why do we not find more iron relics of the past? Explain.

2. Discuss the world commerce in iron and steel, and show present day tendencies.
3. Prove that iron did exist in ancient times.
4. What invention greatly increased iron manufacturing? Why?
5. Discuss the growth of the iron industry in the United States.
6. What factors enter into the best location for iron smelting?
7. How is iron ore formed? What are the principal kinds? What factors enter into the desirable qualities of ore deposits?
8. Where do the principal world ore reserves lie? What are the principal ore districts in the United States? What state leads?
9. Describe the methods of mining iron ores.
10. Give the principal advantages and disadvantages of each method.
11. Explain the various ways in which iron is transported.
12. Describe the use of machinery in loading and unloading ores.
13. Why is water transportation preferred for ores? Prove your answer.
14. What factors enter into the location of iron and steel foundries?
15. Where are the leading regions of iron and steel making in the world? In the United States? Why?
16. What countries lead in production of ore? Of steel? Are they the same ones? Why?
17. Why are new steel plants being located near the Great Lakes?
18. Discuss the Birmingham region. What are its favorable points?
19. Describe the process of reducing iron ore to pig iron.
20. Contrast the qualities of cast iron, wrought iron, and steel.
21. How is iron changed into steel? Describe the different methods.

SECTION 2—THE PRECIOUS METALS

Platinum. Although in recent years platinum has become the most costly of commercial metals, for many years it was treated as an inferior metal. Its name "platinum" in Spanish means "little silver," which name was given to it when discovered in Colombia over two hundred years ago. Its rise to its present economic status is due to the discovery of its superior qualities and also to the scarcity of it. Platinum is used in the laboratory, because it melts only at very intense heats and resists the action of acids. Crucibles made from it are especially valuable to the chemist for these reasons.

The dentist also uses it for teeth fillings because of its resistance to acid reactions. The photographer and electrician find it very valuable in their work. Jewelers demand more and more of the scant supply for making high-grade jewelry, because of its beauty and wearing qualities.

To meet the growing demand for platinum, several explorations have been made to find new deposits, but without much success. It does occur in a few sections in our country but in no great amounts. The Ural Mountains in Russia held practically a monopoly on its production until the World War when Colombia, the place where it was first found, came into the leadership.

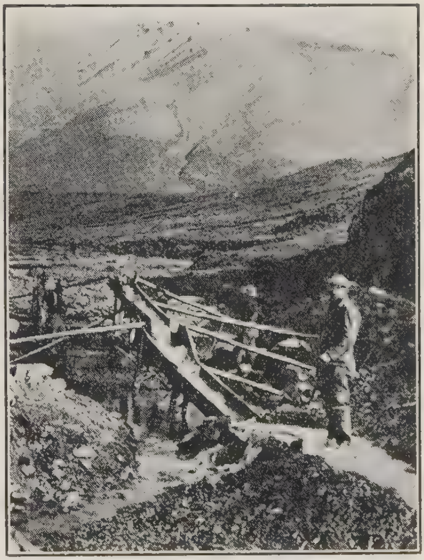
Platinum is found like gold in placers and mines. Sometimes it is found in gravels of river beds in the form of small nuggets and scales. Sometimes it is mined in veins like other minerals. It is superior to gold in wearing qualities and, because it is scarcer, commands a price almost three times that of gold.

Gold. Ancient records and ruins show us that gold has been sought for and used, either for money or ornamental purposes, since the earliest times. Down through the centuries there has always been a demand for gold due to its scarcity and properties, and there has also been a corresponding effort to supply this demand.

The great gold discoveries which occurred about the middle of the last century in America, Australia, and later in

Africa, were particularly timely in that they supplied the necessary gold for the large amount of money needed to carry on the rapidly increasing world trade.

Gold occurs in ores, in veins of quartz, and in tiny free particles. The rain and water washes away the particles from the rocks in which they are imbedded and carries them along until they are deposited in the sand and gravel along the banks of streams, in the bottoms of the rivers, and in beach sands. When gold is thus found it is called a placer. The gold is separated from the gravel and sand by mixing them with water and allowing the gold to settle. As gold is seven times heavier than the gravel, it quickly settles to the bottom.


(Keystone View Company, Inc., N. Y.)
FIG. 159. PLACER GOLD MINING IN ALASKA

Sometimes it is "panned" which means that the miner swirls the gravel and water around in a large pan and when the gold has settled, throws out the gravel and water, leaving the gold in the bottom.

The same process occurs when sluice boxes are used. Here the gravel, water, and gold are washed down through long sluice boxes, the gold settling along the bottom of the boxes, where it is kept back by cleats. Sometimes the gravel bank is washed into the sluice boxes by a powerful stream from a hose. This is called hydraulic placer mining.

When gold is found in the bottom of rivers, dredges are used to bring the sand, gravel, and gold to the top of the water, where it is separated by the sluice box method.

When gold is found in rock veins, it is necessary first to crush the rock to fine powder. This is done in stamp mills where large trip hammers pound the rock into dust. The gold is then separated by gravity, or more generally, by chemical processes. As gold often occurs in conjunction with other metals in ores, it is profitable, in some cases, to separate the gold when reducing these ores. The process of breaking up the ores by hammers or stamps is followed, and the gold is taken out by chemical means.

Gold mining divides itself into placer or surface mining, and rock or underground mining. Gold is separated by either gravity or chemical means. One objection to placer mining is the spoiling of lands further down the stream by the great deposits of dirt, sand, and gravel. Sometimes this has ruined agricultural lands and worked havoc with the channel of the stream.

The leading countries in gold production are Natal, the United States, Australia, and Canada, although many other countries produce sizable outputs. The annual world production of gold is not great in comparison with other commercial products, being less in value than the anthracite coal mined in Pennsylvania annually. This is well because too great production would cheapen the value of gold and thus tend to raise prices in general. One reason for the higher prices of this time is the constantly increased store of gold in the world.

The annual demand for gold for money purposes takes almost the whole production. Gold is well liked and almost universally used for money, because it is relatively valuable for its weight, is easy to mint, is easily carried around, can be easily divided and increased, is readily recognized, and furnishes a good standard for storing up value for the future. In coins, copper is generally used as an alloy because of the softness of gold.

Gold is also used much in jewelry, watches, gold plate, rings, and in dentistry. It does not rust and is not easily affected by chemicals.

We produce considerably less than one-tenth of the world production of gold. Our leading states are California, Colorado, Alaska, South Dakota, and Nevada.

Silver. The value of silver, in ancient times, was equal to that of gold. Its extraction was difficult, which made it as rare as gold. It was well known in the Americas, as is proven by the quantities taken from the South American tribes by Spaniards.

During colonial times, while its presence here was known, little was mined because of the difficulty of extracting it.

It was not until 1859 that silver in large quantities was discovered in the Sierra Nevada Mountains. This discovery led to a rapid expansion of silver mining, especially in Nevada. The most famous deposit was the Comstock Lode, which has produced millions of dollars worth of silver.

The leading silver countries in the world are Mexico, the United States, Canada, and Peru. Our leading states are Utah, Montana, Idaho, Arizona, and Nevada.

Most of the silver produced today comes from the reduction of ores containing other metals. Much of the silver of Montana is found in copper ores. In Idaho, the lead ores yield most of her silver.

Silver is used in coins and in plating ornaments, table ware, and jewelry. It is no longer a standard of value, gold, which is more stable and rare, having replaced it. There are, however, a few countries that still retain silver as a money standard.

TEXT QUESTIONS

1. Explain the high cost of platinum.
2. Why is platinum so valuable to the chemist? Dentist?
3. Where is platinum mined? How is it mined?
4. How does gold occur?
5. Describe placer mining by hand. By machinery.
6. Describe how gold is mined underground.
7. How is gold extracted?
8. What are stamp mills?
9. Explain the equality of silver and gold in ancient times.
10. How does silver occur? Where is it mined principally?
11. What is platinum used for? Gold? Silver?
12. Why are these metals called the precious metals?

SECTION 3—MISCELLANEOUS METALS

Copper. Copper is one of the earliest metals known to man. Numerous relics of copper and bronze, which is an alloy of copper and zinc, are found in ancient ruins in Europe and in America. Most of the tools used in building the Egyptian pyramids were of copper or bronze. Remains in the dwellings of the early mound builders in North America are of this metal.

The Indians knew the use of copper as is shown by their arrow heads. It is easily understood how early man and savages used copper first among the metals, because when found in a pure state it needs no refining, but can be hammered and worked easily even without heat.

Colonial attempts to mine and refine copper met with little success, because of the difficulties in refining the ores. About the middle of the last century, discoveries of great copper deposits in Michigan greatly spurred on copper production. Eventually the control of the mining in this district passed into the hands of a few large corporations, the principal one of which is the one that owns the Calumet and Hecla mines which have yielded good returns to the owners for many years. In this district, the copper is found in almost a pure state, necessitating but little smelting.

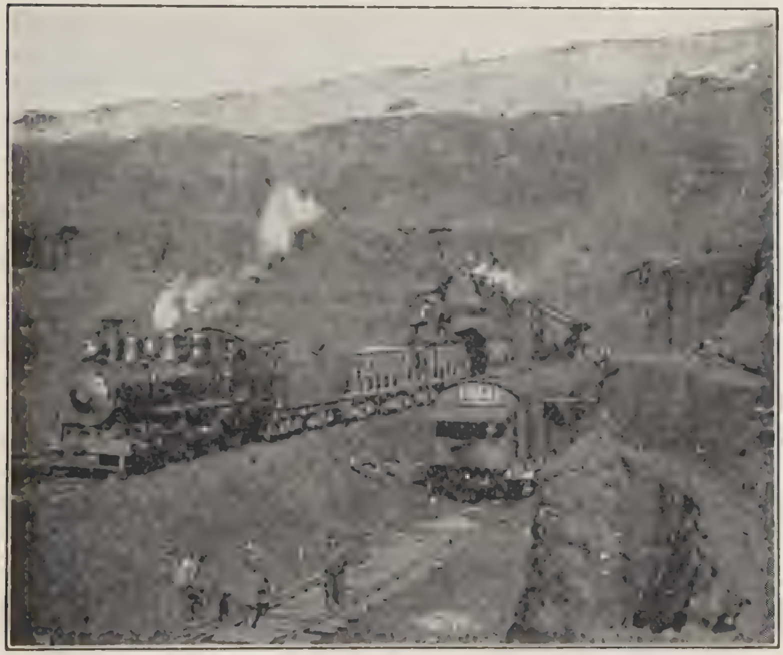
Later, discoveries near Butte, Montana, resulted in the lead passing to this region. Arizona then took the lead and has held it since. Utah has come into prominence, due to the fact that new methods of working her low-grade ores have met with success. The states that now lead in the production of copper are in order of importance Arizona, Montana, Utah, and Michigan.

The United States leads the world in copper production, supplying almost three-fifths of the world supply. Copper forms one of our most valuable contributions to world trade. In value it ranks next to iron among the metals, being greater in value than our production of both gold and silver combined.

Other countries which are important in copper production are Chile, Belgian Congo, Japan, Mexico, and Canada. In Europe, Spain has long led in its production.

We import much copper, principally in the form of copper ore, from countries which have little or no coal for smelting purposes. There is also demand for bulk freights on returning steamers from these countries.

Nearness to ocean ports and coal supply are among the reasons why so many of our copper refineries are located in the eastern section of our country. Our principal customers, to whom we export, are Germany, England, and France, in order of importance.



(Keystone View Company, Inc., N. Y.)

FIG. 160. COPPER MINING IN MICHIGAN

The increased use of electricity greatly stimulated the production of copper, because copper seems to be the most practical metal for electrical use. The use of copper in automobile construction and in building construction also has created a large demand for copper. As the copper demand has grown, a corresponding growth is found in production.

Science is finding new uses for copper all the time, such as boilers, electrical refrigeration, radio accessories, and washing machines. The alloy of copper with zinc to make brass, with tin to make bronze, and with aluminum to make aluminum bronze, finds also a constantly increasing demand to be met by increased and cheaper production. Copper coins have been used for centuries for small coins.

Lead. Early references show that lead was well known among the ancients, and was used by them for water pipes, for covering the bottom of ships, for money, and in the form of paint. Some lead mining was carried on among the early colonists in this country, because lead was particularly valuable to them for molding into bullets and in alloying to make pewter dishes.

Great deposits of ore having large quantities of lead were found along the Mississippi Valley, and soon Missouri took first place in lead mining and has held it ever since. Other important lead producing states are Idaho, Utah, and Colorado. Important lead producing countries are the United States, Spain, Mexico, and Canada.

Lead rarely occurs in a pure state, but is generally found in an ore called galena, from which it is extracted. It is used much in the making of paint, by plumbers in the form of pipes and fittings, and in heavy weights, shot, bullets, and type.

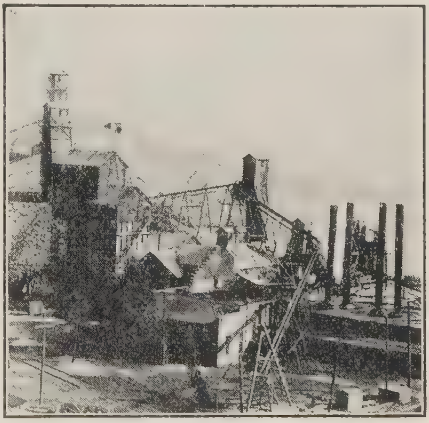
Zinc. Zinc, as a separate metal, was probably not known until the eighteenth century, except possibly in China. The brass of ancient times, which is an alloy of copper and zinc, was probably made from copper and ores containing zinc. The systematic production of zinc in this country dates from the last part of the nineteenth century.

The United States produces about one-half of the world supply. The tri-state district (Missouri, Kansas, and Oklahoma) produces about two-thirds of this domestic production. Other important states are New Jersey and Montana. Several European countries produce zinc, principally Germany and Belgium. England and France are our best customers, England taking almost a half of our exports. We import from Mexico.

Zinc is valuable, because it combines with copper to make brass. It is also used much in making galvanized iron, which is iron coated with zinc by electricity. Zinc plates are also used in making illustrations for books. Zinc also is an important base for zinc paints.

Tin. Remains of tin have been found in the ruins of the Swiss Lake Dwellers, who lived thousands of years ago. The Phoenicians sought out, and brought back with them, tin from the mines in Cornwall, England. Probably tin from the same source found its way into Rome.

Tin occurs only in a few regions. It is found in placer mines and also in rock and ore veins like gold. It is extracted, like gold, by gravity or by chemical processes after being ground to powder. The tin mines of England furnished tin for centuries, but over 60% of the world's supply now comes from southeastern Asia and the Straits Settlements.



(Keystone View Company, Inc., N. Y.)

FIG. 161. ZINC AND LEAD MINE, JOPLIN, MISSOURI

Tin is valuable because it can be plated over iron and forms a rust-proof covering. In the form of tin-plate, which is tin-plated iron, it forms the basis of our so-called tin dishes and utensils, tin roofing plates, and tin cans. The supply of tin is limited and great ingenuity and skill are necessary to use it economically by spreading it as thinly as possible on the iron base.

The United States is almost wholly dependent upon imported tin, as our domestic supply is very small. As we use more tin than any other country, we are forced to import almost fifty per cent of the entire world production, principally in the form of tin bars which we later make into tin plate. Most of this tin comes from the Straits Settlements and England.

Aluminum. Aluminum is one of the newest metals in commercial use. Although it is found almost everywhere in the earth, the high cost of extracting it has limited its common use. It is now being extracted from an ore called bauxite, which in this country, is found in four principal regions, Arkansas, Georgia, Alabama, and Tennessee. Arkansas at present furnishes over 80% of our supply.

As the extraction of aluminum from bauxite requires much power and electricity, its production is carried on near large water power sites, principally Niagara Falls, New York, Badin, North Carolina, Alcoa, Tennessee, and Massena, New York. Aluminum is also being extracted in Europe in France, Germany and Italy, near water power sites.

The processes of extracting aluminum are being constantly improved and cheapened, but with this decrease in cost comes a large increase in the demand for this metal. It is used extensively in electrical work, especially for high transmission wires where its lightweight and toughness are desired. It is used more and more in automobile construction and this use is increasing rapidly. It is valuable in aeroplane and dirigible construction. Railroads are using it to reduce the weight of their equipment. The Navy is finding increasing use for it. Kitchen utensils of aluminum are becoming more and more popular. New alloys of aluminum and other metals increase the demand for aluminum. Certain salts of aluminum are used in paints.

The discovery of a cheap process which would enable us to extract the aluminum we know is in the earth would greatly increase its use and render a real service to industry.

TEXT QUESTIONS

1. Prove that copper was well known in ancient times.
2. Where is copper now mined principally?

3. Why is the United States such a large exporter?
4. What is copper used for?
5. Why is copper used in industry?
6. What was lead used for in olden times?
7. What is it used for now? Why?
8. Where is lead mined? How?
9. Where are the principal deposits of tin?
10. Explain the importance of tin to industry.
11. How does the United States stand as a producer of tin?
12. Why do we lead the world in tin consumption?
13. What has retarded the use of aluminum?
14. Where is aluminum manufactured? Why?
15. What is aluminum used for? Why?
16. Where is zinc found? What per cent of the world's production do we supply?
17. What is zinc used for? Why?

PROBLEMS AND PROJECTS

1. Collect pictures of the various metals in the different stages of production.
2. Make a list of all the metals you can and locate their principal regions of supply.
3. Why did the iron industry spread westward after Revolutionary times?
4. Explain why more iron articles have not come down to us from early times. What action does the atmosphere have on iron? Explain.
5. Make a map of the United States and show where our principal iron deposits are. Also locate the leading iron and steel centers.
6. Collect as many samples of iron ore as you can and label them.
7. How is iron formed in large deposits? Illustrate.
8. Discuss the different ways in which iron is mined.
9. Discuss the advantages of being near the market for an iron center.
10. Draw a diagram of a blast furnace and explain how it works.

11. Collect pictures of the iron industry.
12. List the articles with which you come in contact daily that are made of iron.
13. Make a list of iron articles exported. Imported.
14. Why is platinum not used for money? Why is silver used? Gold?
15. Make a list of articles made of platinum.
16. Make a list of silver articles in your home.
17. Why has copper become so important in industry?
18. What articles do you use that are made from aluminum?
19. In what ways do you use lead? Zinc? Tin?
20. What is galvanized iron? Describe this process.

TOPICS

1. History of iron and steel.
2. A modern blast furnace.
3. Steel making in the United States.
4. Automobile steels.
5. How a steel rail is made.
6. The United States Steel Corporation.
7. Platinum.
8. Gold.
9. Silver.
10. Copper.
11. The paint metals.
12. The future of aluminum.
13. The Gold Rush of 1849.
14. South African gold supply.

FOR CLASS DISCUSSION

1. Copper is more valuable than aluminum.
2. Zinc paints are better than lead paints.
3. Labor conditions in the steel industry should be bettered.

PART III—REGIONAL FACTORS

- Regional Factors
  - Western
    - United States
      - In General
      - New England States
      - Middle Atlantic States
      - Southern States
      - Central States
      - Western States
      - Possessions
    - Miscellaneous
      - Canada
      - Latin North America
      - West Indies
    - South America
      - In General
      - Colombia
      - Ecuador
      - Venezuela-Guianas
      - Peru-Bolivia
      - Chile
      - La Plata Countries
      - Brazil
  - Eastern
    - Europe
      - In General
      - British Isles
      - France
      - Germany
      - Belgium
      - Holland
      - Mediterranean Countries
      - Scandinavian Countries
      - Central Countries
      - Balkan-Baltic Countries
      - Russia
    - Asia
      - In General
      - Western Asia
      - India
      - China
      - Japan
    - Australasia
      - East Indies
      - Malay Peninsula
      - Australia
      - New Zealand
    - Africa
      - In General
      - Northern Africa
      - Equatorial Africa
      - Southern Africa

CHAPTER XXII

REGIONS OF COMMERCE

Man is a most important factor in the study of commerce and industry. He is the cause of all commerce and industry. Unlike the animals of the field and woods, he has sought to better his living conditions. Consequently, he has used the gifts of nature to satisfy his ever increasing wants.

The raw materials of the forests, mines and farms, the products of lakes, rivers and oceans are being turned to man's use. The different regions of the world produce many different kinds of raw materials. This difference in the production of various regions is one of the causes of commerce. The wants of one region can be satisfied by the surplus of another region.

In this section we shall study more particularly the various commercial regions of the world in order to understand the geographic causes that affect man and his ability to produce commodities. We shall begin with a study of the main commercial regions of North America, because this is the continent on which we live, and also because it is one of the most active continents in the world in the production of commodities and the development of trade.

THE UNITED STATES

Physical Divisions in General. The most active political division of North America is the United States. In order to understand the causes that have affected the full development of this country, a brief survey of the chief physical regions will be made at this time.

The New England Hills. East of Lake Champlain and the Hudson River Valley, we find a very rugged, hilly country with a thin, poor soil. This poor soil is due to the action of the glaciers, which carried away to the south and into the ocean, much of the soil that was originally located here. The low mountains and hills of this region have a northerly and southerly direction, sloping gradually from the Canadian border to the sea.

About the only lowland in this region is the valley of the Connecticut River, where a very rich soil is to be found. This entire region affords a most excellent example of the effect of the geography of a region upon the business of its inhabitants. No single, rich, staple crop like cotton or wheat could be grown in this section for export to Europe; hence, the people of this region turned to manufactures and fishing at a very early date in order to make a livelihood.

North Atlantic Lowland. The narrow strip of land extending from Cape Cod to the Potomac River is generally called the North Atlantic Lowland. It varies in width from ten to thirty miles. Much of this region, consisting of sandy soils and extensive marshes, is too wet to cultivate. In Maryland and Delaware, where the soils are better drained, there is extensive gardening and fruit growing.

South Atlantic Lowland. On a map of the United States, trace a line from the southern part of Texas, northeastward to Kentucky and then southeastward through Alabama and Georgia and along the Atlantic coast to the Potomac River. This region is commonly called the South Atlantic Lowland. On this plain grows most of the cotton in the United States. Here, also, is to be found, the densest negro population. These rich, level plains, easily worked and abundantly productive, led to the plantation type of farming. Here it was that slavery first took root on American soil and existed long after it was found to be unprofitable in the hilly and less fertile regions.

Piedmont Plateau. This is the name given to the hilly, rugged region immediately to the east of the Appalachian Mountains. The word is a combination of two French words, pied meaning foot and mont meaning hill. Literally then it means foothills. The higher portions of this plateau have relatively poor soil and here we find fruit growing and mixed farming the principal type of agriculture.

Along the eastern edge, where the plateau drops down to the coastal plain, is the site of many cities, such as Atlanta, Columbia, Raleigh, Richmond and Trenton. These cities have grown up because of the power furnished by the falling waters from the edge of the plateau. This drop from the plateau to the coastal plain is often called the "fall line" and the cities that have sprung up along this line are often called the "fall line cities."

The Appalachian Mountains. This range of mountains extends from the borders of the Hudson Valley, in southern New York, to Georgia and Alabama. Here are found many fertile valleys, due to a large amount of limestone in the soil. A peculiar feature of this region is an almost continuous valley from New York State to Alabama. This is known as the Great Valley.

The Alleghany Plateau. A hilly and much cut up plateau lies just west of the Appalachian Mountains. This region extends from the Helderberg highlands, near Albany, New York, in a southwest direction through western Pennsylvania, West Virginia, southern Ohio and the larger part of Kentucky and Tennessee.

The Lake and Prairie Plains. This region includes most all of the area north of the Ohio River and east of the Mississippi River. It is one of the important agricultural regions in the United States. No other is so well adapted to the needs of commerce. The navigable rivers and generally level country afford excellent facilities for transportation by water, rail or auto truck. This region is therefore easily accessible.

The Great Plains. Beginning at a point where the Missouri River turns east towards the Mississippi River, there is a gradual rise in the elevation of the country until the Rocky Mountains are reached. The rainfall in the western part of this region is relatively slight and agriculture for the most part must depend on irrigation or the cultivation of drought resistant plants. Much of the region is a natural pasture land, but overgrazing has changed large areas of grass regions to almost barren deserts.

The Rocky Mountains. The Rocky Mountains cover for the most part the states of Idaho, Montana, Utah, Wyoming, Nevada, Colorado, and parts of Arizona and New Mexico. This region is little changed from its natural condition. Aside from the production of minerals and some secluded fruit growing regions, this section of the country plays but a small part in the commerce of the country.

The Pacific Slopes. This region contains many rich valleys suitable for fruit growing. The northern slopes have an abundance of rainfall and a climate splendidly suited for agriculture. The southern section is drier and must depend on irrigation.

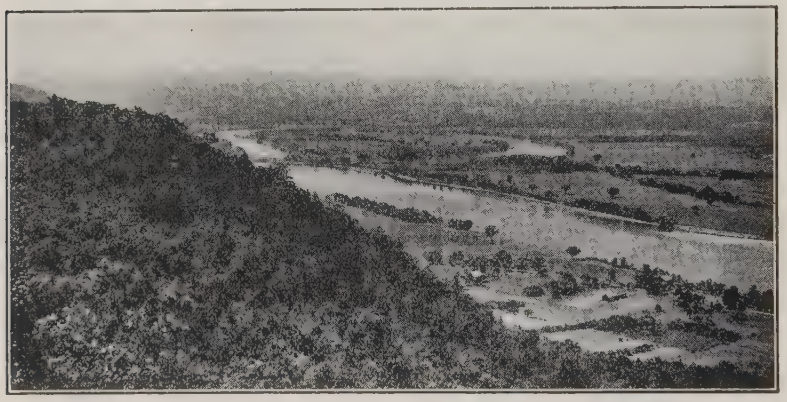
SECTION 1—THE NEW ENGLAND REGION

Climate and Surface. New England is for the most part a very hilly and rugged region. The soil is very thin, consisting of gravelly and stony loams and, with the exception of limited areas, is unfit for agriculture. The north and south trend of its mountain systems presents a barrier for transportation lines reaching the interior of the continent. The coast line is broken up and affords many excellent harbors. This "stern rock-bound coast" is indeed a place for the development of a rugged citizenship. The wealth of coast line in New England has played no small part in the development of its fishing and shipbuilding industries.

Unfortunately the climate of New England is not like that of Old England. The winters are long and relatively cold. However, in the southern section the climate is less harsh. Some sections in Connecticut are so favored by climate and soil that such a sub-tropical crop as tobacco can be grown to advantage.

New England is covered with many beautiful lakes, which afford a pleasure ground for the tourist during his vacation months. The business of recreation is one that nets the natives of this region many thousands of dollars in the course of a season.

Agriculture. Despite the relatively thin soil and harsh climate, there are a few favored sections for farming in New England. In northeastern Maine, there is considerable sandy loam soil. This type of soil, together with the cool, moist weather of this section, makes an ideal combination for the growing of potatoes. Aroostook potatoes are famous in all the eastern city markets.



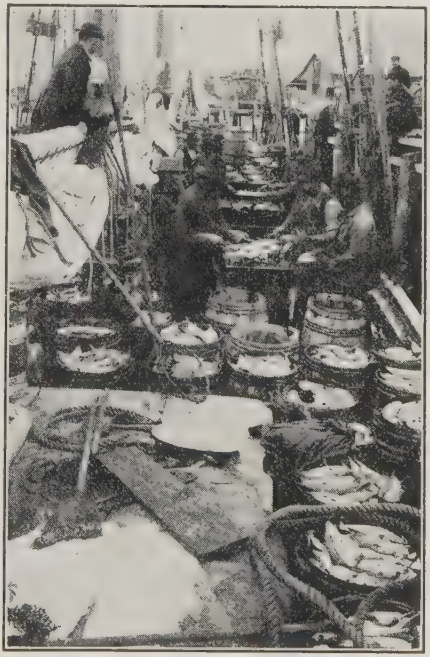
(Photograph by Ewing Galloway, N. Y.)

FIG. 162. CONNECTICUT RIVER VALLEY NEAR HOLYOKE, MASSACHUSETTS

Special crops, such as tobacco and onions, are cultivated on other limited areas in the Connecticut Valley. The abundance of pasturage and water also gives many parts of this region an advantage in dairying. Many farms in Vermont, New Hampshire, and Maine, that are too hilly for the plow, turn to dairying. This is now by far the most important branch of agriculture in New England.

The excellent market for dairy products in the many large cities, together with through lines of transportation, has caused a tremendous growth in this industry during the last twenty-five years. Each night long trains of milk cars gather up the milk from many remote stations of western and northern New England and carry it into Boston and other cities. Thus the farmer near Bristol or Rutland, Vermont, finds a market for his commodity, thanks to modern methods of refrigeration, sanitation and transportation.

Fishing. A peculiar feature of the ocean bottom, along the coast of New England, is the continental shelf. This shelf reaches out under the waters of this region for several miles and affords an excellent fishing ground. Here the herring, halibut, mackerel, cod, and haddock, together with the lobster, thrive in relative abundance. The necessity for food and the presence of so rich a fishing ground naturally turned the attention of the people to fishing. Most of the fish are salted or smoked for the market. Some, however, are canned in oil like sardines. The cities leading in the fishing industry are Boston and Gloucester.



(Courtesy U. S. Department of Commerce)

FIG. 163. MACKEREL ON BOARD VESSEL, GLOUCESTER

Manufactures. In order for manufacturing to develop in any section, there must be some means of obtaining mechanical power. Other factors that help in this development are labor supply and a market in which to dispose of the commodities. New England slopes abruptly from the Canadian border toward the Atlantic Coast, thus causing its rivers to be swift moving. These swift moving rivers, forming rapids and waterfalls, afford an abundance of cheap power for the running of the many mills in this region.

The fact that the soil of this region is too poor to afford an adequate income for so great a population makes it imperative that the people turn to some other activity than agriculture for a livelihood. Most of the people of this region are alert, industrious, intelligent and skilled workers; and the numerous cities in this region, connected by steam, water, and automobile lines, afford excellent markets for the finished products of the various mills and factories.

Types of Manufacturing. It was but natural that the cotton and woolen mills should locate, to such an extent, in New England. Water power was the most important factor in determining their location. The cities of special importance in this industry are Fall River, Manchester, Fitchburg, Lawrence, Lewiston (Maine), Pawtucket, and Providence. Fall River is specially favored for manufacturing textiles, because it has both water power and ocean transportation. This two-fold advantage makes Fall River one of the greatest manufacturing cities in the United States.

During the middle of the eighteenth century a Welsh shoemaker settled in Lynn, Massachusetts, and began the manufacture of shoes. Thus began another characteristic industry of this region. Other cities leading in shoe making are Brockton, Haverhill, Boston, Manchester (New Hampshire), and Salem.

The presence of so great a forest in the early colonial days furnished bark for the tanning of leather. Massachusetts still has a large number of tanneries and Boston is the largest leather market in America.

Other industries of this region are the manufacture of silver-plated ware in Meriden, Connecticut; men's hats in Danbury, Connecticut; brass goods in Ansonia and Bridgeport; firearms in Springfield; hardware in New Britain; machine tools in Worcester; wire screens in Winooski on Lake Champlain in Vermont; and paper in Holyoke, Massachusetts.

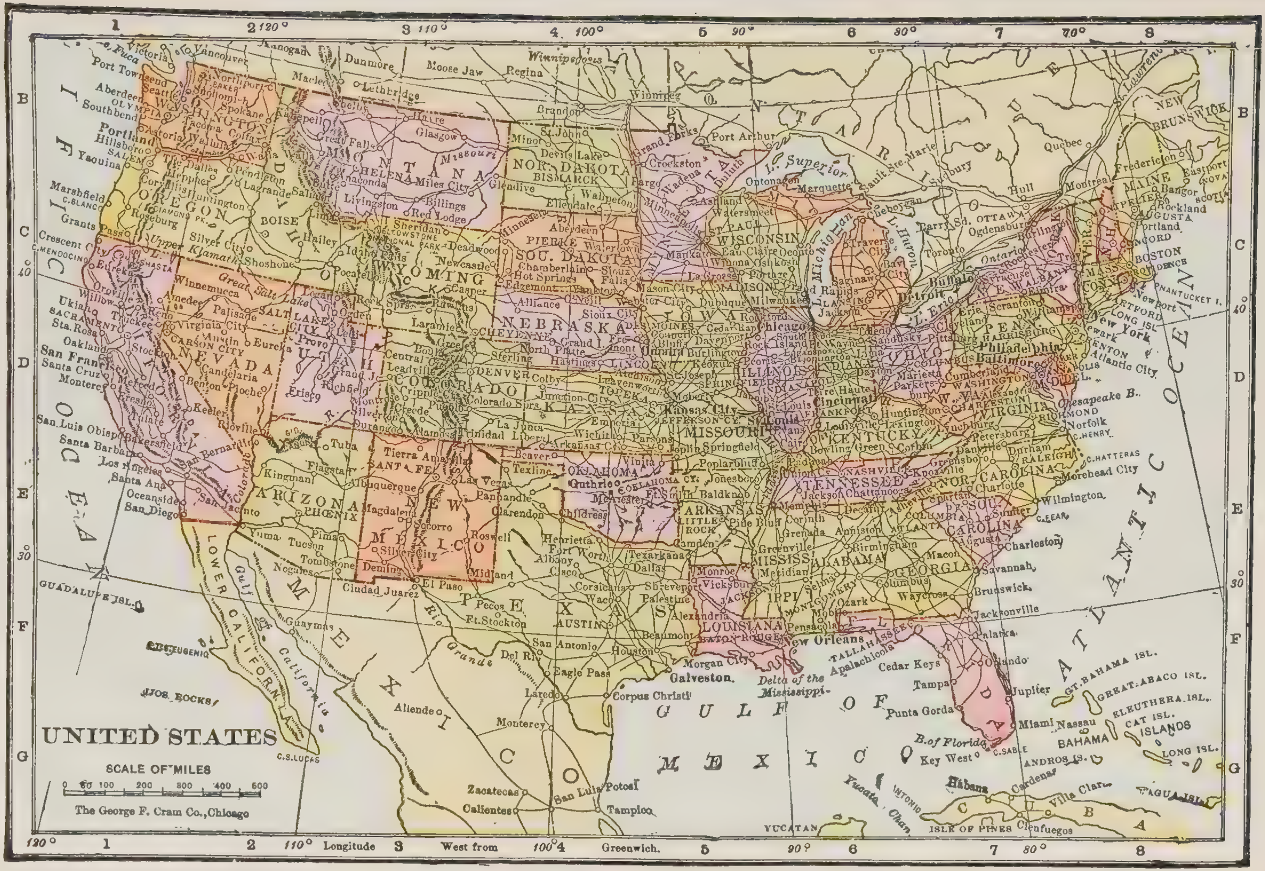

UNITED STATES
SCALE OF MILES
0 50 100 200 300 400 500
The George F. Cram Co., Chicago
Longitude West from Greenwich.
ATLANTIC OCEAN
GULF OF MEXICO
PACIFIC OCEAN

FIG. 164

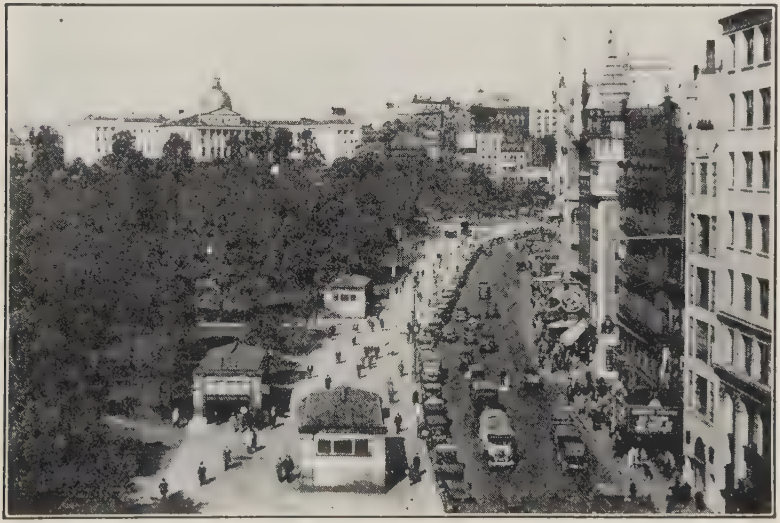
Minerals. New England is lacking in coal and iron, the two minerals so important in the manufacturing world of today. This region has, however, at least two minerals of considerable commercial importance, namely, building stone and marble. Granite is quarried to a considerable extent around Quincy, Massachusetts, and marble is found in abundance at Proctor, Vermont.

Cities. A region so little fitted for farms, but rich in waterfalls and a broken coast line affording excellent harbor facilities, is likely to become a region of cities. Such is the case in New England. Nearly 80% of the population of New England lives in cities of over 2,500 inhabitants.

Notwithstanding the innumerable harbors affording good sites for cities, the seaports of New England do not have the commercial importance of the cities of the Atlantic coastal plain like New York and Philadelphia. This is due, in no small measure, to the fact that the direction of the valleys in New England is north and south rather than east and west. This trend of the mountains and valleys shuts out the cities on the New England coast from easy access to the interior of the United States. This entire region is a natural outlet for much of the St. Lawrence Valley, but an artificial boundary line prevents the cities on the northeast coast from profiting from a natural, geographic location.

Of all the cities in New England, Boston is the most important. It is the principal seaport of New England. Its deep harbor and the fact that it is also the terminus of the railroads running to the west, giving her a share of the western trade, enables Boston to surpass all other New England cities. It is a great leather and wool market, and, despite the fact that it is located far from the stock raising regions, has a considerable slaughtering of meat animals. It is the financial center for most of the New England mills. Fine metallic goods, such as tools, watches, and jewelry, are manufactured here. Large retail stores of nation wide fame serve the needs of a large area.

As a business center, Boston includes many cities and towns lying close by, such as Somerville, Cambridge, Quincy, Charlestown, and Everett. Were the metropolitan sections of Boston to combine into one great city, as have the municipalities near New York and Chicago, Boston would probably rank as the third city in population in the United States.



(Photograph by Ewing Galloway, N. Y.)

FIG. 165. TREMONT STREET, BOSTON

At the left is a section of the Boston Common; the State House is in the background.

The other cities of this region are more important industrially than commercially. Providence, Fall River, New Haven, Bridgeport, Springfield, Hartford, Worcester, Manchester, Portsmouth, and Portland, Maine, are all located on excellent harbors or on large streams. Due to the size of their hinterlands, or tributary areas, and the north and south direction of the valleys, their growth in economic importance has been much slower than the more favored cities west of the Berkshire Hills. The cities of northern New England are very small. This is due primarily to the fact that they are not in the line of trade, and transportation facilities are more meager because of the ruggedness of the country.

Transportation Facilities. While New England has a wealth of good harbors, there is no large river, flowing from the interior, navigable for any great distance. The Penobscot River, in Maine, though navigable for some distance, comes through a distinctly rural region. It does not open a rich hinterland, like that of the Hudson, Mohawk, or even the St. Lawrence. Thus river transportation in New England has never developed to any great extent. The earliest routes were, of course, the Indian trails, which, in the main, followed the valleys and streams. The building of roads followed many of these trails. Thanks to the automobile, New England is covered with a network of good roads so that large freight trucks, as well as pleasure tourists, can reach all sections of this region.

Three railroad systems serve New England, namely: the Boston & Maine; the New York, New Haven & Hartford; and the Boston & Albany Railroad, a part of the New York Central system. The Boston & Maine road covers the northern route from Albany to Boston and northern Maine. The New Haven route serves southern New England. It connects Boston with New York and touches almost all of the larger cities of southern New England, such as Providence, New Haven, Bridgeport and Hartford. Connecting, as it does, two large metropolitan districts, the New Haven road is one of the greatest passenger carrying roads in the United States. The Boston & Albany system covers a middle route between the above named roads, touching the cities of Worcester, Springfield, Pittsfield, and Albany.

General Outlook. The poor soil and limited areas of farms in New England make it impossible for the New England farms to compete with the richer lands in the West. New England is primarily a manufacturing region. While many of her industries owe their start to water power, her continued success is due principally to the supply of skilled laborers and credit facilities.

This region no longer has the monopoly of mechanical power. The center of manufacturing has been moving steadily westward as the use of coal and electricity has developed. New England also has the advantage of being close to a large market. This region, together with the North Atlantic region, contains a greater number of cities of over 100,000 inhabitants than any other region in the United States. These cities, therefore, afford a large market for the manufactured products of this region.

TEXT QUESTIONS

1. Name the dominant surface features of the United States.
2. Why are there so many abandoned farms in New England?
3. What important vegetable grows in northeastern Maine? arroostook [illegible]
4. Name two minerals found in abundance in New England.
5. Why is dairying an important industry in Maine and Vermont?
6. What geographic and economic factors favor fishing along the coast of New England?
7. Name a commodity manufactured in each of the following cities: Meriden (Connecticut), Providence, New Britain, Brockton, Danbury, Lawrence, Winooski (Vermont).
8. Why is New England so predominantly a manufacturing region? Hilly [illegible]
9. Name and locate two cities in New England noted for their fisheries. Boston Gloucester
10. Why is New England more thickly populated in the southern area than in the northern area?
11. Name three important railway systems of New England. Boston [illegible] Boston & Albany N.Y. N.H. & Hartford
12. What percentage of the people of New England live in villages and cities? Why? 80

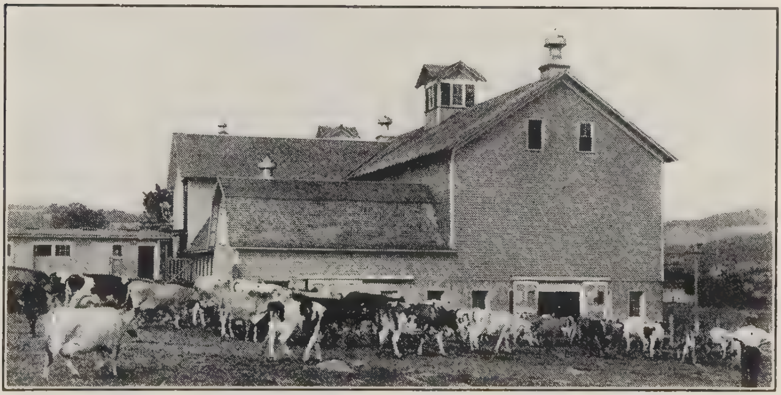
SECTION 2—MIDDLE ATLANTIC REGION

In General. This region includes, for the most part, all of the states of New York, New Jersey, Pennsylvania, Delaware, and Maryland. From a commercial and industrial point of view, this is one of the most active regions in the United States. The excellent harbors and valleys, opening toward the interior of the continent, together with a wealth of natural resources, go far toward explaining the presence of so large a number of cities of over 100,000 inhabitants. The principal trade routes of both land and sea converge in the principal harbors on this seacoast.

Climate and Soil. The climate of this region is generally cool and invigorating. Most of this region is between the January isotherm of 30 and 20 degrees Fahrenheit and the July isotherm of 60 and 70 degrees Fahrenheit. No other region in eastern United States has a more stimulating climate for agriculture, manufacturing, and trade. The southern portion is somewhat warmer, though for the most part it has an ideal climate for the major portion of the year. The succession of summer, autumn, winter, and spring seasons, with their changes in rainfall, sunshine, heat and cold, is no small factor in making this region the abode of a thriving, energetic people.

The larger portion of this region is hilly and rugged, including the northern ends of the Appalachian and Alleghany plateaus. This region, for the most part, consists of brown, gravelly and stony loams. Along the eastern bank of the Hudson are to be found reddish sand and clay loams, while in central New York, along the Mohawk River and Erie Canal, considerable light brown loam from limestone drift is to be found. In the more level regions, including Long Island, New Jersey, southeastern Pennsylvania, Maryland, and Delaware, there are reddish sandy and clay loams, and yellowish sandy loams.

Agriculture. There are many sections in this region, as for example, the wheat region in the Genesee Valley, that were quite famous in the agricultural world. But, for the most part, this region is no longer able to compete with the western farms. There are, however, a few sections especially favored for special types of farming. The plain around Lakes Ontario and Erie, together with the Finger Lake region and the Hudson Valley, are important fruit sections. No better apples are to be found than those from the Lake Ontario region, while grapes, peaches, pears, currants, other small fruits, and vegetables, grow in abundance in the Finger Lake region and the Hudson Valley. The presence of large bodies of fresh water, which store up latent heat during the summer months and thus delay the early autumn frosts, makes this section well adapted for fruit growing.



(Photograph by Ewing Galloway, N. Y.)

FIG. 166. A LARGE DAIRY FARM IN NEW YORK STATE

Another region, favorable for agriculture, is the sandy loam section on the coastal plain in Delaware and Maryland. This region is admirable for truck farming and pays large profits to the farmer on account of the richness of the soil, and the markets offered by large cities nearby. The main products of this trucking area are melons, tomatoes, cranberries, peas, potatoes, beans and corn. Some of this plain is poorly drained, as in parts of New Jersey; thus great areas of land are useless for agricultural purposes.

The abundant rainfall and the hilly country of the plateau regions of this section, which afford excellent pasturage. cause the dairy industry to be a most important branch of agriculture. In some districts, through lines of railways take the milk to market, while in other districts, milk is made into butter, cheese, or condensed milk. New York is the chief dairy state of this region. The return from the land is much greater from dairying than from most other products. In the early days of the republic, New York was a great wheat growing state, but with the opening up of the richer lands in the West, the farms of this section were no longer able to compete in the raising of this commodity.

Owing to the prevalence of dairying, hay is, on the whole, the leading crop, especially in New York and Pennsylvania. Potatoes are also common, and special crops like hops, beans, cabbages, onions, and sugar-beets are cultivated intensively on limited areas.

Fishing. The harvest of the sea, while not so rich as that of the New England region is, however, quite abundant. The most important fishery product of this region is the oyster, the most productive beds being located in the Chesapeake Bay. The continental shelf extends down the entire coast making an excellent fishing ground. Other sea foods of this region are clams and shad.

Manufactures. The abundance of coal and water power, and the numerous large cities which afford markets are the chief causes for so large a concentration of manufacturing in this region. Aside from the great Appalachian coal fields of bituminous and anthracite, there is a wealth of possible water-power development. Niagara Falls will be a potent factor in the further development of the city of Buffalo.

Characteristic manufactures of this region are textiles in Cohoes, Amsterdam, Utica, and Philadelphia; gloves in Johnstown and Gloversville; collars in Troy; clothing in New York and Rochester; kodaks and camera supplies in Rochester; shoes in Binghamton; typewriters in Ilion and Syracuse; rifles and library supplies in Ilion; furniture in Jamestown; silk in Paterson, New Jersey; iron and steel in Pittsburgh; electric machinery in Schenectady; locomotives in Philadelphia; potteries in Trenton; canned goods in Baltimore.

This entire region represents a great variety of manufactured products. For example, the city of Syracuse, New York, has a great variety of manufactured products and stands first in the production of a few. The leading characteristic manufactures of this city are steel tools and gears, automobiles, soda products, chinaware, and typewriters.

This entire region is an excellent example of the natural economic and human reasons for the concentration of manufacturing. Here is plenty of power, good transportation facilities, and markets. Certain industries have also grown because of an early start.

An example of this last reason is illustrated in the case of Troy, New York. According to government reports a large percentage of the collars, cuffs, and shirts manufactured in the United States are made in Troy. There is no geographic reason why this industry should have located here. It is said, however, that detached cuffs and collars were first invented in Troy, and on a house in Third Street of that city is a tablet bearing this legend: "In this house, probably before 1827, detachable shirt collars were first made and the collar industry originated by Hannah Lord Montague 1794-1878." Thus the accident of an early start is the main reason for the beginning of the collar industry in Troy, but the fact that the labor and capital necessary for this industry are here in abundance is the chief factor in keeping Troy supreme in collar making.

Minerals. One of the principal coal fields of the world is found in this region. All along the western flank of the Alleghany Plateau the best grade of bituminous coal is to be found. This seam of coal has had much to do with making Pittsburgh and the surrounding country a great manufacturing district. In eastern Pennsylvania, around Scranton, Wilkes-Barre and Pottsville, is practically all the anthracitic coal in the United States. This small area is, therefore, of more than ordinary commercial importance.

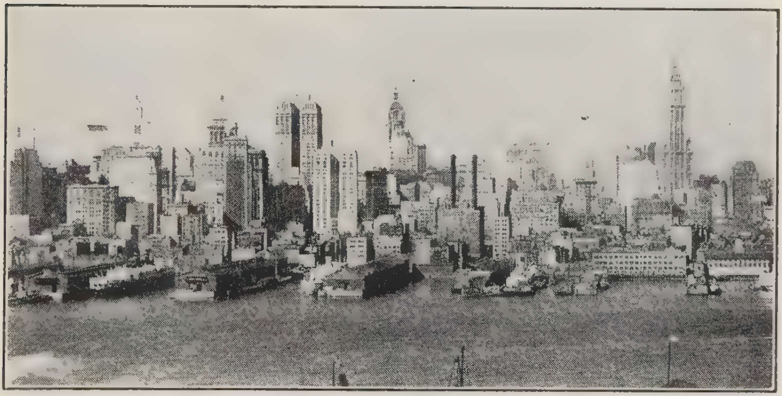
This region must supply the anthracite coal consumers of the northeastern states, as well as some of the Canadian provinces.

Building stone is quarried extensively in this region. Pennsylvania holds first place in slate and limestone, and New York in sandstone. The large clay deposits of the Hudson Valley and the region about Trenton, New Jersey, give rise to brick manufacturing and pottery. Salt and gypsum deposits are found throughout New York. The principal salt deposits are now to be found in the vicinity of Ithaca, on the east shore of Cayuga Lake and southwest of Rochester. Iron ores are found in considerable quantities throughout this region, but they have proved less profitable than the richer ores of the Lake Superior region.

Cities. The middle Atlantic states are better favored by nature for commercial centers than New England. This is due, in no small measure, to the fact that the general direction of the valleys of this region is east and west. Boston, Portland (Maine), Providence, Fall River, and Bridgeport do not have the commercial importance of New York, Philadelphia, and Baltimore. The opening through the Appalachian Mountain system in the Mohawk-Hudson Valley region affords an unequalled site for large cities.

This depression in the mountain range, leading north and west into the heart of the continent, gives New York City the best natural connections with the interior. The mouth of the Hudson River is, therefore, the natural focusing point of commerce on both land and sea. It is but natural, then, that a great commercial metropolis should grow up at this point. The supremacy of New York City in trade and commerce is due to its excellent harbor, large wharfing facilities, rich hinterland, and the fact that it is located where the cost of shipping from the interior is low.

New York City is a center of general industry. Because of its varied interests, New York is also the leading financial and banking center of the entire country. Its manufactures are many and varied, although clothing is perhaps the leading one. This industry has centered here principally on account of the presence of so much cheap foreign labor, skilled in that particular trade. Printing and publishing hold an important place; in fact, no other city approaches New York in this respect. This great metropolitan section includes all the urban population of northeastern New Jersey, Long Island, and Westchester County on the north. The prime importance of New York is well illustrated by the fact that approximately 50% of the commerce of the United States passes through its port each year.



(Photograph by Ewing Galloway, N. Y.)

FIG. 167. NEW YORK CITY

The second seaport of importance in this region is Philadelphia. This city, although located on the Delaware River, is actually a seaport. In colonial times Philadelphia was the metropolis of the country, but the coming of the era of railroads and the settling of the west cost its preeminence as a metropolis, as well as a leading commercial city. Another factor that has prevented its full development as a foreign trade center is that the harbor is not always free from ice, as is the case with New York harbor.

The interests of Philadelphia are, therefore, industrial rather than commercial. This city is one of the greatest textile manufacturing cities in the country. The refining of sugar and petroleum, the manufacturing of locomotives and shipbuilding also hold large places.

Baltimore has the advantage of deep tidal waters and is a seaport of considerable importance. Although it is the seaport nearest to the upper Ohio Valley, mountain barriers prevent it from profiting from this proximity. Its hinterland is limited to portions of southern Pennsylvania and Maryland. Typical industries of Baltimore are tobacco manufacturing, the canning of fruit and vegetables, and oysters.

(Courtesy of New York Central Lines)

FIG. 168. NIAGARA FALLS
Niagara Falls supply hydro-electricity to cities of northern New York.

Pittsburgh, located at the meeting of the Alleghany and Monongahela Rivers, is a natural site for the location of a city. The presence of a great coal seam in this region has made Pittsburgh a great manufacturing city. While its preeminence in the steel industry is partially due to the presence of an abundance of coal and excellent position in relation to routes of transportation, the fact that Pittsburgh is located near the great steel consuming part of the United States is of no less importance in its development. Pittsburgh leads in blast furnaces, iron and heavy steel products, and glass.

Buffalo, located at the foot of Lake Erie, holds a position of great commercial advantage. The district really includes the manufacturing plants at Niagara Falls and the steel mills at Lackawanna. The presence of the great falls of the Niagara River furnish the city with the largest and cheapest water power in the world. This cheap power will be a potent factor in the future industrial development of this district, as well as of the western parts of New York State and Pennsylvania. Buffalo is the lake terminus of the Erie Barge Canal. It is a great distributing center for the manufactured products of the eastern states, as well as the foodstuffs and raw materials of the Middle West. Its manufactures consist largely of meats, foundry products, flour, automobiles, and lumber.

Other cities of importance in this region are Albany, Rochester, Syracuse, Utica, Binghamton, Scranton, Wilkes-Barre, Bethlehem, Trenton, and Erie.

Transportation Facilities. As in New England, the building of roads followed somewhat old Indian trails, while some turnpikes like the Cherry Valley Road, now called the Great Western Turnpike, ignored the valleys in an almost east and west direction over hills and down valleys with no thought of seeking out a level route. Another such route was from the Susquehanna River west to Pittsburgh, at the junction of the Alleghany and Monongahela Rivers.

Later came the era of canal building, which became one of the important factors in the development of this region. The principal canal today is the Erie Canal, through New York State. This canal has lately been enlarged and, though still relatively unused, could go far toward the lessening of freight rates in the carrying trade of such commodities as coal, lumber, wheat, salt, and sand. The Erie Canal, or Barge Canal as it is now commonly known, extends across the state of New York from Troy to Buffalo. This distance, from its beginning at Troy to Lake Erie at Buffalo, is 355 miles, of which 215 miles lie in natural waterways like the Mohawk River and Oneida Lake. Sixty municipalities are touched on the line of this improved waterway, while forty-four others, located on the Hudson River below Troy, have the benefit of its service.

The movement of freight by water is the cheapest method of transportation and, despite the fact that the canal is not used to anywhere near its capacity, it is of the highest interest to trade and commerce that so great a competitive influence should be maintained.

The railway routes of this region may be summarized as follows: The break in the Appalachian system, through the Mohawk Valley, enables the New York Central to lead in carrying freight and passengers to and from the west.

The Pennsylvania System has branches in nearly all parts of the state of Pennsylvania and western New York. Its main line, running from New York, Philadelphia, and Pittsburgh, enables it to tap the very region sought by the New York Central.

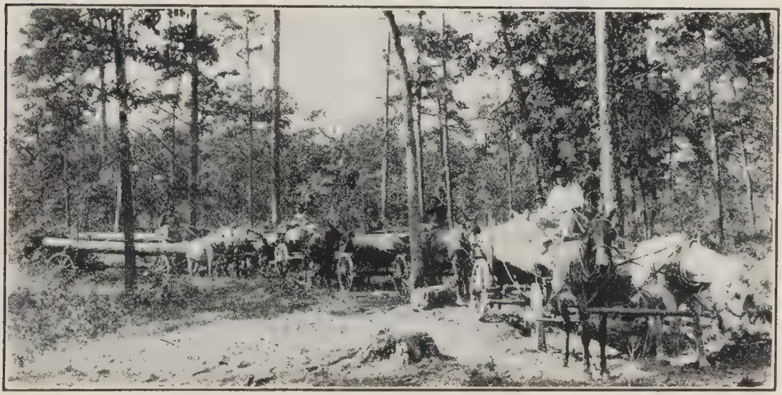
Other important lines in this region are the Baltimore & Ohio, the Lackawanna, the Lehigh Valley, the Ontario and Western, and the Delaware and Hudson. The Erie Railway connects New York with Chicago by way of the Delaware and Susquehanna Rivers and then through the Chemung Valley of southern New York.

TEXT QUESTIONS

1. What states are usually included in the middle Atlantic states?
2. How does the relief of this region affect the commerce and industry of its people?
3. Where are the fruit growing and market gardening regions of the middle Atlantic states? Why?
4. In what city is each of the following commodities manufactured: typewriters, silk, chinaware, locomotives, kodaks, shoes, furniture, underwear, carpets?
5. What advantages does the city of Buffalo have for industrial development?
6. Where does the Barge Canal of New York State begin? Where is its terminus?
7. Name five railway systems in the middle Atlantic region that connect the ocean with the Great Lakes.
8. Why is the New York Central Railway system called the "waterlevel route"?
9. Locate the following cities: Pittsburgh, Baltimore, Scranton, Trenton, Erie, Rochester, Syracuse.
10. What is each of the following cities noted for in the field of industry: Paterson, Troy, Johnstown (New York), Trenton, Yonkers, Cohoes?

SECTION 3—SOUTHERN REGION

In General. South of the Potomac River extending westward and including the states of Oklahoma and Texas is the region usually called the southern states. No other region in the United States has been so little affected by recent immigration from Europe. Here we find a larger percentage of people who are directly descended from the first European settlers than in any other section. The region includes all the broad, coastal plain stretching from North Carolina around through Texas, and even north to the junction of the Ohio and Mississippi Rivers.



(Courtesy U. S. Forest Service)

FIG. 169. LOGGING IN ARKANSAS

Soil and Surface. The soil of the southern lowlands near the sea is of a sandy variety. In the uplands are to be found reddish sands and clay loams. In these uplands we find the soil less fertile, with the exception of portions of Kentucky and Tennessee. It is rather significant that slavery never had the strong hold upon this section that it had in the more fertile regions to the south. The regions about the Mississippi River contain rich, alluvial soils that naturally caused a region of large plantations. Thus, the institution of slavery was found to be less economic and profitable in the more rugged regions, like those of West Virginia and Kentucky, long before the Civil War.

Climate. The South has nearly every variety of climate, from the subtropical type of Florida and the Gulf Coast to the temperate climate of the uplands.

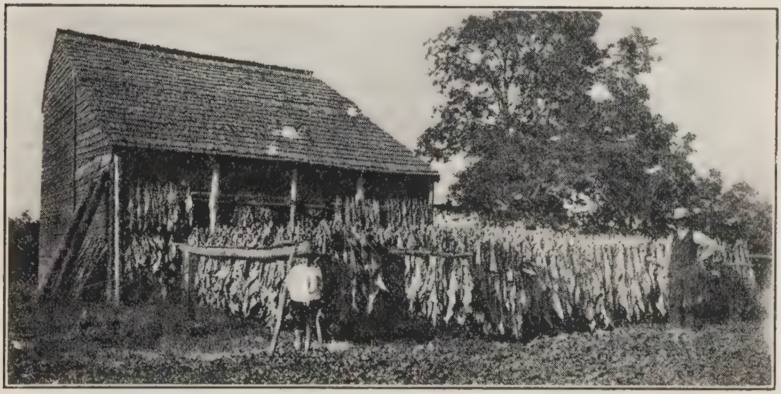
Forests. Along the rugged Appalachian ranges is to be found the largest body of merchantable hard wood in the United States, including oak, sycamore, hickory, and black walnut. On the sandy plains and the swampy lands, the yellow pine and cypress trees abound. From the sap of the long leaf pine trees of this region, two valuable by-products are obtained, namely, turpentine and rosin. This region produces over sixty per cent of the world's supply of turpentine.

Farm Products. The northern part of this region is hilly and rugged in most places. There are numerous rich valleys where abundant crops of fruit and cereals are raised. The rich Shenandoah Valley has long been famous as a general agricultural region.

Two sections of livestock raising are to be noted. The first is found in the upland valleys of Tennessee and Kentucky where many cattle are raised. Kentucky in particular has long been noted as the favorite breeding place of race horses. The second region is on the plains of Texas, where the long-horned steer has been largely replaced by the better varieties of the short-horned species. The vast grassy plains of this semi-arid region afford an excellent pasturage for cattle, and are another example of climatic and topographic features affecting the activity of the people of a given region.

It was early discovered that this region would grow tobacco which is one of the contributions in the agricultural field that America has given to the world. This commodity began to be in great demand in Europe shortly after the discovery of America. It soon became evident to the early colonists that the growing of tobacco would furnish a valuable money crop, and for over two hundred years it has been almost the sole commercial crop of this region.

Another reason for its predominance as a leading crop is that the early colonists had no other staple product which they could export to England in return for other goods. Nor was there power to be had in their streams for the development of manufactured products to export. Tobacco became a medium of exchange that saved the early settlers from failure.



(Courtesy U. S. Department of Agriculture)

FIG. 170. SUNNING TOBACCO

No plant is more affected by the soil and climate than tobacco. Each district seems to produce a distinct quality; hence, we come to know of the various tobaccos as Virginia leaf, Connecticut leaf, or Kentucky leaf. The United States is the greatest grower of tobacco in the world. Over one billion pounds are produced annually.

Despite the fact that this crop is an important money crop, it is most injurious to the soil. Because of the large and profitable returns to be obtained from the growing of this crop, farmers have continuously planted the same field year after year in tobacco until the soil has been exhausted. This fact accounts for the poor condition of much of the soil in Virginia and North Carolina.

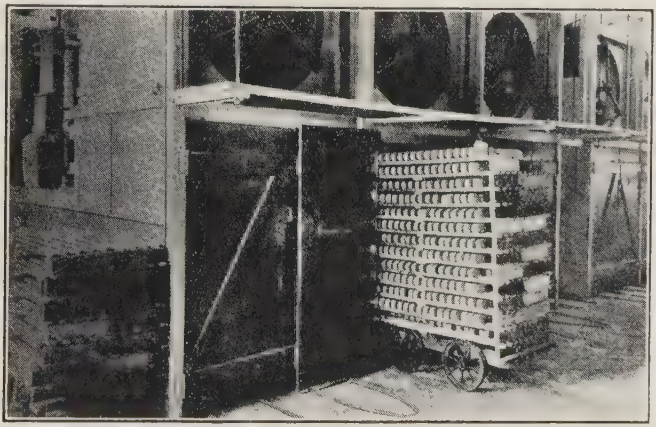
The practice of crop rotation would do much to restore the fertility of these worn out tobacco farms. This has been done in some of the northern states, notably southern Pennsylvania, where splendid crops are grown on small farms. The principal states of the southern states in the production of tobacco are, in the order of amount produced, Kentucky, Virginia and North Carolina. Louisville, in Kentucky, located near the tobacco fields, is the greatest tobacco market in the world. In the eastern section of the southern states, markets of considerable note are Richmond, in Virginia, and Winston-Salem, in North Carolina.

The cultivation of cotton was begun in the United States during colonial times, but owing to the slow method of separating the seeds from the fiber, the commodity cost too much to be used for the manufacturing of cloth. However, after the invention of the cotton gin by Eli Whitney in this country, and of spinning machinery in England, this crop began to increase in importance. The work of the cotton fields was simple and required no skilled labor of any kind and almost no tools. This made slave labor adaptable to cotton growing and did much to establish, in the South, the large plantation system of agriculture and the use of slave labor.

Cotton growing has also had a notable effect in this region on the economic and political outlook which in the past separated the interests of the southern people from those of the northern people. In an economic way, we can note that their ideas are vastly different, for the New England cotton manufacturer demands a tariff on imported goods to protect himself against the European manufacturer, while the southern planter, who buys his manufactured goods, is injured by such tariff and naturally opposes it. The above fact had much to do with the maintenance for many years of the so-called "solid South" in the political field.

The United States is by far the largest producer and exporter of cotton and cotton products in the world. Over 65 per cent of the world's supply of cotton is produced in the United States. Cotton grows in all the southern states, from Texas to Virginia. The leading states in order of production are Texas, Mississippi, Alabama, and Georgia. The principal ports for the shipping of cotton are Galveston, in Texas, and New Orleans, in Louisiana.

Cotton is the one crop that is still largely cultivated by hand. Great improvement has been made in the growing and harvesting of such crops as hay, oats, wheat, and corn with the aid of machinery. At the present time, man can grow more cotton than he can pick. The great migrations of negro labor to the North has made the southern cotton labor problem more acute.



(Courtesy U. S. Department of Agriculture)

FIG. 171. A BY-PRODUCT OF COTTON SEED OIL—SOAP

Several attempts, which have met with more or less success, have been made to invent a cotton picking machine. If such a machine should be perfected, its economic effect would be but little less revolutionary than that of the invention of the cotton gin in 1795. In addition to increasing the area of cotton production and the consequent cheapening of clothing it doubtless would free the plantation owner from dependence on cheap labor.

The seed of the cotton fiber was formerly thrown away or used for fertilizer. Today it is the most valuable by-product of the cotton plant. The seeds are ground and pressed to extract the oil, which is used for making soap and as a substitute for olive oil. The residue, after the oil is pressed out, is called cake. This is fed to dairy cows or to cattle for fattening purposes.

Corn is a product of the uplands of the southern region. Near the coastal plain, sweet potatoes grow in abundance. Peaches are to be found in the Piedmont Plateau region in Georgia and the Ozark region of Arkansas.

Sugar-cane is a tropical and a sub-tropical plant. Its cultivation is confined largely to the gulf states. It has long been the leading crop in Louisiana, where close to 90 per cent of the total crop of sugar-cane in this country grows.

Rice has been grown along the Georgian and South Carolina coasts for a long time. It is now grown in Louisiana and Texas, where it is being produced on a large scale. The level nature of the land and the use of pumps in spreading the water over the crop, together with the modern methods of reaping and threshing, enable the American farmer to raise almost fifty times as much rice as a Chinese farmer can with hand labor.

Peanuts grow over a wide range of country in the southern states. They are found as far west as Texas, but Virginia leads in the amount produced. Norfolk, Virginia, is the leading market for peanuts.

Orange growing has been carried on with success in Florida, though the cultivation of this crop is more uncertain in this state than it is in southern California where killing frosts are less liable to destroy the crop.

Other sub-tropical fruits grown in Florida are pineapples and grape fruit. The latter has become a most important part of the breakfast menu.

Minerals. Aside from the large bituminous coal deposits in the Appalachian Ranges, the supply of minerals in the southern states is not very large. Iron is mined and smelted at Birmingham, Alabama. This city has an advantage over other smelting centers in that it is located in the fields of ore as well as fuel.

A mineral of considerable economic value, namely phosphate, is found in the South. This mineral is one of three minerals most sought after by those interested in agriculture. Without phosphate, potash, or nitrate, it would not be long before the soil of the world would become exhausted. The greatest known deposits of phosphate rock are in the southeastern section of this country, and, because of its vital importance in the fertility of the soil, these deposits are one of the most important mineral resources of the country. South Carolina and Florida have the greatest deposits of this mineral. It is also found in considerable quantities in Tennessee and Arkansas. According to data and figures obtained from the Bureau of Mineral Resources, this section of the United States produced over three million tons of phosphate in the year 1928, which is considerably over fifty per cent of the production of the entire world.

Louisiana contains deposits of rock salt and sulphur. These deposits of sulphur have enabled this country to exceed Italy in the production of that mineral and to produce over 80 per cent of the world's supply.

In the matter of mineral fuels, the states of Texas and Oklahoma hold an important place. Next to the state of California, the state of Oklahoma produces more petroleum than any other state in the nation. There are also large areas of oil fields in Texas which have brought considerable prosperity to that great state.

Manufactures. While the South has been backward in the matter of manufacturing, it is beginning to develop along that line. The South has been distinctly agricultural, and is so, to a large extent, today. There are, however, in the South two very important factors in the development of manufacturing, namely, plenty of raw materials and power in the form of coal and water.

The great cotton fields of the south can furnish abundant material for the factories right at home, and thus save the cost of transportation. Lumber is also to be found in abundance. The coal of the mountain ranges and the water falls of the uplands and Piedmont sections will be a source of power for years and years to come.

The manufactures of the South are, therefore, for the most part, concerned with raw materials of local origin, on which freight charges would be high if they were shipped any great distance. Thus, we find lumbering industries located near the forested regions and centered in Little Rock, Arkansas, Montgomery, Alabama, and Memphis, Tennessee; leather goods in Waco, Texas, and packing house products in San Antonio and Fort Worth, all of which cities are located near the great pasture lands of Texas; sugar refining in New Orleans; the iron industry in Wheeling, West Virginia, and Birmingham, Alabama; while the tobacco industry is located at Key West, Florida, Richmond and Petersburg, Virginia, and Winston-Salem, North Carolina.

It is in the cotton industry that the South should have its greatest opportunity. Here we have the center of location of raw materials, plenty of power and a supply of cheap labor. With the building of railroads north and west, the South is no longer isolated, but is also near to the great markets of the East and Middle West.

These advantages should go a long way toward shifting the center of cotton spinning and manufacturing from the northeastern section of the United States to the southern section. Many cotton mills are already established on the fall line, where the water falling from the Piedmont Plateau to the low coastal plain furnishes abundance of power. Thus we find the industry developed in such cities as Columbia, South Carolina, Raleigh, North Carolina, and Augusta and Atlanta, Georgia. These mills have a further advantage in being able to draw on a cheap supply of labor from the poorer uplands of these states.

Cities. Because of the agricultural tendencies of the South, the population remained almost stationary during the nineteenth century. The cities of the South have been slow to feel the impulse of the new development which took hold of the rest of the country during the middle decades of that century. Affected so little by immigration, the cities of this section were of slow growth and of a very conservative type.

Another factor that has caused the South to be left behind is that the movement of people has been east and west. In spite of the large numbers of Europeans coming to this country, very few found their way into this section. Then, too, the Appalachian Mountains in this region are a formidable barrier, affording fewer passes that easily reach the interior. This fact is a vital one, and partially accounts for the reason that Savannah, Atlanta, and Richmond are not such great centers as New York, Philadelphia, and Baltimore.

The coast of this section is not so advantageous to commerce as that of the northern section, as most of the coast line is straight and fringed in many places with sand bars and reefs which make it impossible, or difficult, to find a landing place. Hence, no harbor, such as the northeastern section shows, has developed.

The rural character of the southern region is further shown when it is pointed out that in 1927 there were only twelve cities in this entire region having a population of over 100,000. Compare this with the fact that in New York State alone there were eight cities of over that number. All through the South, however, cities are increasing in population, especially in Texas, Tennessee and the states in the Piedmont region.

The metropolis of the South is New Orleans. This city is both a river port and a seaport. Its elevation is only about ten feet above sea level, and is below the top of the levee. Here is an example of how man has mastered an unfavorable natural location and made it a fit place for dwelling. The river at this point is about one mile wide, affording an excellent harbor with plenty of wharfage. The city owns and controls the docks and terminals.

New Orleans holds one of the most strategic positions of any of the cities in the United States. It is the natural outlet of the entire Mississippi Valley, and in all probability, had it not been for the fact that the western section of this valley was in the possession of a foreign nation at the time of our nation's birth, New Orleans would have become the most important shipping center in the country. Even in the early days statesmen and politicians of the East, especially those of New York City, saw that New Orleans was a natural competitor for the trade of the then great, unsettled Middle West. This fact was a potent reason for the building of the Erie Canal, which tended to turn the trade away from the river, through the lakes and the canal to New York.

(Keystone View Company, Inc., N. Y.)

FIG. 172. TRANSPORTATION ON THE MISSISSIPPI RIVER

The port of New Orleans is accessible to the largest steamships. The fact that it is farther from Europe than New York militates somewhat against its taking any great share of that trade. Its position with reference to the West Indies and South America, however, is most favorable and, in the further development of trade with those countries, this city will hold a most important place. According to statistics from the Bureau of Census, New Orleans carries about six per cent of the foreign commerce of this nation and ranks third in that respect. It is the largest exporter of cotton. Sugar, wheat, corn, and tobacco are also items of export that amount to considerable sums every year. The chief imports are coffee and bananas.

The second port of importance in the South is Galveston. This city, though an important port, is without a natural harbor. It was only by building jetties far out into the gulf that a satisfactory harbor could be made. At present the harbor is a very excellent one, having a channel of some twenty-eight feet in depth. Galveston is an outlet of Texas and the Southwest as far north as Denver.

Because of the rail lines connecting this port with the interior, and also the wealth of resources in the shape of raw materials of the great state of Texas, Galveston is a close rival of New Orleans for the carrying of commerce. At the present time, she has a very slight lead over New Orleans in the actual amount of foreign commerce carried. Galveston also has the advantage of trade with South America.

Birmingham, in Alabama, is often called the "Pittsburgh of the South." This city is located in the heart of the coal and limestone district at the end of the Appalachian range. Its business is chiefly concerned with mining, blast furnaces and steel mills.

Going farther east, the next most important city is Atlanta in the state of Georgia. This city, located near the end of the Great Valley of the Appalachian range and near the east and west passes, is called the "Gateway of the South."

Norfolk, in Virginia, is the Atlantic port of Louisville and Cincinnati.

Louisville is noted as a tobacco center. More leaf tobacco is handled here than in any other city in the world. It is also a prominent railroad center.

In Florida, the city of Tampa on the west coast is located near the large deposits of phosphate and is the only deep water harbor for hundreds of miles along the gulf coast. Jacksonville is probably better known than any other city of the same size in the country. It has become a famous winter resort for northern tourists and is the terminus of important coast line railways. Key West should also be mentioned. It is the most southerly city in the United States.

Transportation Facilities. The greatest railroad system in the South today is the Southern Railway. This system reaches nearly every important town from the Chesapeake Bay to Florida and from the Atlantic Ocean to the Mississippi River.

A second very important line is the Illinois Central, running from Chicago, and paralleling the Mississippi River to New Orleans. This railway taps the great Central West and does much to bring a considerable portion of the nation's trade to New Orleans.

The Louisville & Nashville road connects St. Louis with Cincinnati, Memphis, Atlanta, and Mobile. Two very picturesque roads are the Atlantic Coast Line, skirting the Piedmont plateau from Chesapeake Bay to Jacksonville, and the Florida East Coast Line. This latter road connects the city of Key West with the mainland, being built one hundred miles out into the sea through the use of bridges and various small islands off the Florida coast.

TEXT QUESTIONS

1. What states are included in the southern region?
2. Name three important agricultural products of the South.
3. Why is tobacco growing injurious to the soil?
4. What is meant by "the fall line"? Locate four cities of the South on this line.
5. What advantages does Galveston have as an ocean port?
6. Why is the Appalachian forest of so great value?
7. For what purpose is cotton seed used?
8. What is turpentine? Rosin?
9. What are the principal minerals of the South, and where are they found?
10. What city is the leading market for each of the following products: turpentine, peanuts, sugar, lumber, cotton seed, tobacco?

SECTION 4—THE CENTRAL STATES

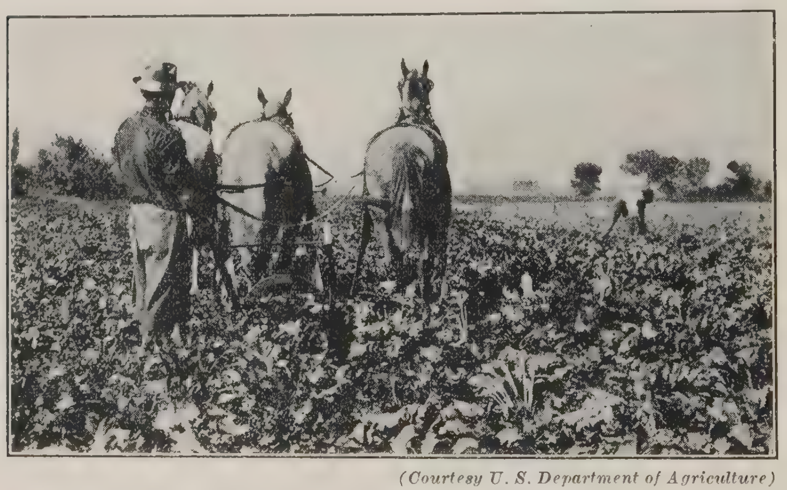
In General. This section is often called the Middle West, especially by those dwelling east of the Appalachian Mountains. This section comprises about 25 per cent of the area, about one-third of the population, and nearly 60 per cent of the agriculture of the country. The states of Kansas, Iowa, Illinois, and Missouri contain more acres of improved land than any other section of the country. The physical nature of this region naturally turned the attention of its settlers to farming.

Climate and Soil. The level and rolling prairies with a deep rich soil have been an attractive magnet to the farmers of the stony and hilly farms of New England and the Atlantic states. The climate of this region is largely of the continental type, the winters being very severe and the summers long and hot. West of the 100th meridian of longitude, the rainfall is so slight that there is not enough moisture for farming without irrigation.

Forests. A portion of this region was almost treeless when the white man first came to the country, but there were also sections where lumber was to be had in abundance. Today, in the eastern and southern sections some hardwood trees, principally oak, ash, basswood, birch, and maple, remain. From the central part of Michigan, north through Minnesota and Wisconsin, there was originally a great forest of white pine, hemlock and spruce. This region has become almost exhausted and no longer holds the supremacy in production.

Agricultural products. It is in farming products that this section has acquired and holds first place in the nation. The level prairies have offered a fine field for the use of the most improved types of farm machinery, and because of the climate and soil, grain is the principal staple crop of this section, as are cotton and tobacco in the South. The nature of the soil in this section caused wheat and corn to grow as it never had grown before, either in the South or in the northeastern section.

Spring wheat grows mostly in the northern section, especially Minnesota and the Dakotas. Winter wheat grows mostly in Kansas, Oklahoma, Nebraska and Missouri.. The principal region for corn growing is in the belt from central Ohio to central Kansas and from the Ohio River to Wisconsin. Corn from this section goes to the market in the more condensed form of beef, pork, mutton, horses and mules.



(Courtesy U. S. Department of Agriculture)

FIG. 173. CULTIVATING SUGAR BEETS

Another commodity of this region is the sugar-beet. This is one of the few commodities in which there is competition in production between temperate and tropic regions. The sugar-beet belt is just north of the corn belt and runs somewhat into the wheat belt. Thus we find that it rarely competes with corn, for it requires a great amount of hand labor; hence, in those regions where corn will mature, the farmer gets the greater profit per acre from corn rather than from the sugar-beet. Sugar-beets, therefore, are usually cultivated in those regions where it is too cool for corn to mature.

As a result of the labor and climatic requirements, this industry was late in developing in this country. In 1890, this country produced only about 3,000 tons, but because of tariffs, this crop increased until in the year 1928 the crop amounted to over 6,460,000 tons.

The cattle industry and meat packing play an enormous part in the economic life of the people of this section. Cattle raising is a frontier industry, and before the days of the railroad and refrigerator car, its volume was limited and markets had to be near at hand. Today, with the development of transportation and refrigeration, the pastures situated a long distance from the markets, are under no handicap. As settlements advance, the land rises in value, and cattle must seek new pastures farther on. Although cattle raising is more largely carried on in the states farther west, the center of the meat packing industry is in Chicago. The meat packing industry has centered in Chicago also because of transportation facilities. More than one-half of our meat comes from the central states. In point of meat production, Illinois is first and Kansas second. This industry has also extended to South Omaha, St. Joseph, Sioux City, St. Paul, Indianapolis, St. Louis and Cincinnati.

Meat packing is a splendid example of an industry in which modern methods and invention have evolved a large number of by-products. These by-products, as in many other lines of industry, afford the major portion of the profits. What was formerly thrown away and wasted is now utilized for the benefit of both manufacturer and consumer. In the early days, the chief products of the meat packing industry were beef, hide and tallow. Today, in addition to the three products mentioned above, we have combs, hairpins, brush backs, and scoops from the horns. The handles of toothbrushes, razors and knives are made from the shin bones. Buttons, felt, soap, glue, pipestems, chessmen and fertilizer are made from other portions of the animal. Even certain glands are used for medical preparations.

Manufactures. The center of general manufactures in the United States is a little west of central Ohio, and about one-third of the value of manufactured products comes from the central states. As in the East, there is abundant fuel and also plenty of water for power, while, from the standpoint of transportation facilities, the Middle West is unexcelled. Here we have the great inland seas, which reach far into the interior with an outlet into the ocean through either the St. Lawrence Valley or the Erie Canal, while in no other section of the country is there such a dense network of railways. These factors, coupled with the ever increase of the population, promise to make this section one of the greatest manufacturing districts on this continent.

The lumber industry has, of course, centered around the Great Lakes; Duluth, Saginaw, and Bay City are noted for the production of lumber. Because of the power of the rivers and the presence of wood pulp, the paper mill district is located around Green Bay in Wisconsin, Duluth and Sault Ste. Marie. Furniture making, which formerly centered in Grand Rapids because of nearness to the raw material, is still a prominent industry in that city. This industry is held there largely on account of the capital and skilled labor that are already located there. Other large centers of furniture making are found in Sheboygan, Wisconsin, and Rockford, Illinois.

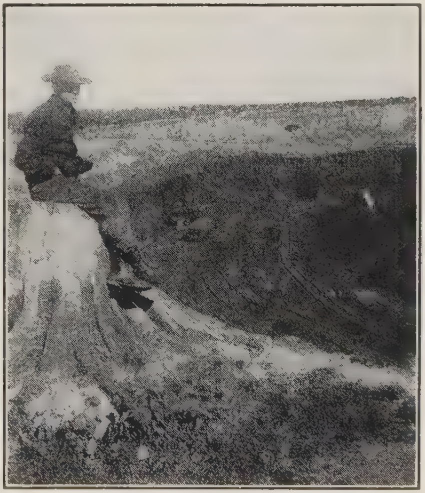
The largest single industry, with the exception of the manufacture of automobiles, is the making of agricultural implements. That this industry should center here, near the great farm lands of the nation, is not surprising. While it is dependent on a large supply of hardwoods, in the main the industry has followed the western movement of agriculture.

In the early days, this center was in New England; later, it was in New York State and Auburn, of that state, was long a prominent center for the manufacture of agricultural implements. The center for this industry is now in Chicago, while Moline, Illinois; Springfield, Ohio; St. Louis, Missouri; Racine, Wisconsin; and Peoria, Illinois, are large manufacturers of these commodities.

Since the beginning of the twentieth century, the automobile industry has grown more rapidly than any other industry with the possible exception of the moving picture industry. Automobile manufacturing has centered largely around the Great Lakes, largely on account of the fact that it first developed in this region, especially in such cities as Detroit, Flint, and Lansing, in Michigan, and Cleveland and Toledo, in Ohio. The growth of these cities has furnished an ample supply of labor and capital for the development of this huge industry, while the bulk of capital invested in the automobile industry is located in this region.

The Middle West, with its rolling level country, has developed the building of roads, so that almost all towns of any size are reached by the use of the automobile. In a few cases, this is the only mode of reaching some of the small ones.

Other industries that are large in this section of the country are the manufacture of rubber goods in Akron, Ohio; cash registers in Dayton, Ohio; leather goods in St. Louis; ready-made clothing in Chicago; and, the tanning of leather in Milwaukee. The clothing industry has centered in Chicago largely for the same reason that it settled in New York.



(Keystone View Company, Inc., N. Y.)

FIG. 174. IRON MINES IN MINNESOTA

Minerals. The principal minerals of this section are gold, iron ore, copper and coal. The gold of this region is found largely in the Black Hills district in South Dakota. The iron ore of this region is a most important mineral for it contains only a small amount of impurities. The ore of the Mesabi region contains as high as 80 per cent pure metal in many cases.

The principal fields are in northern Michigan along the shores of Lake Superior, northern Wisconsin, and Minnesota. Here are found the largest beds in the world. These beds furnish more than four-fifths of the iron ore used in this country and, in bulk, exceed that produced by England and Germany together. In fact, Minnesota furnishes more ore in a year than any foreign country. Most of this ore, as we have seen, is smelted in Pennsylvania, but a large number of blast furnaces are to be found along the Great Lakes, where the ore can be dumped from the barges direct to the smelting plants.

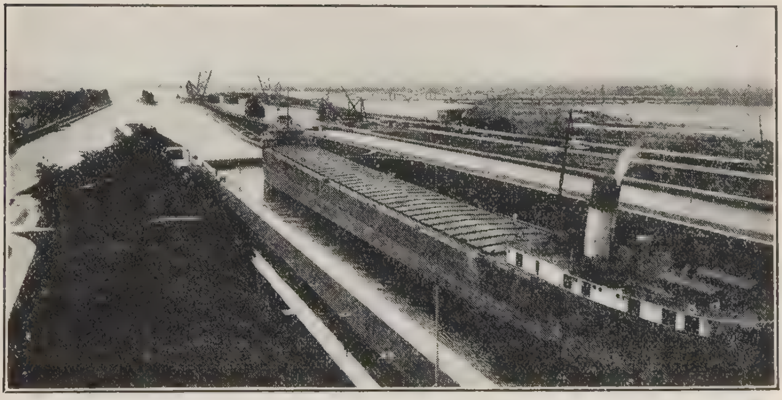
The iron industry naturally gives rise to much of the iron and steel manufacturing works of this section. In such cities as Gary, Chicago, Toledo, Detroit, Cleveland, Dayton, Canton and Elgin, the products of iron and steel form an important part of manufactured articles.

There are also beds of gypsum to be found from Kansas to Iowa; while the abundance of salt in the region about Detroit is one of the causes that has favored the growth of a large chemical industry in that city. In East Liverpool and Cincinnati, near the large clay deposits of southern Ohio, are found extensive pottery works.

Transportation Facilities. It is in the wealth of her natural water routes that the West has an advantage in the carrying on of commerce. In fact, its rapid development during the nineteenth century was aided largely by waterways. The great Mississippi River system, reaching from the far away Rocky Mountains across the continent into New York via the Alleghany River, encouraged the pioneers to push farther and farther into this section to find homes. In the memory of men now living, large portions of this country were a wilderness. The level nature of the country and the wealth of its waterways made possible its rapid settlement at a very early date.

During the early part of the nineteenth century, steamboat traffic started on the Ohio and Mississippi Rivers and continued to develop in a remarkable degree until the era of railroads cut into this revenue. The Missouri has never been used to the same extent as have the other rivers on account of the fact that this region furnished no staple commodity that needed to be carried into the interior, and by the time settlers were ready to settle this section, the building of railroads had begun so that water transportation was not so necessary.

The Mississippi River with its two main tributaries, the Missouri and the Ohio, and their branches drains the larger part of the Middle West. The head waters of this great river system come very close in many instances to the Great Lakes. In the past, canals were dug connecting the lakes with the Mississippi River system, but for the most part they have been too small to meet the needs of the large boats of modern traffic and in some instances have been abandoned.



(Photograph by Ewing Galloway, N. Y.)

FIG. 175. SOO LOCKS

The Soo Canals are the gateway between Lake Superior and the East. They accommodate more freight in annual tonnage than crosses the Atlantic Ocean.

The recent agitation for the St. Lawrence Canal, on the part of the western farmers, is actuated by a desire to find a more direct and cheaper route to the sea. The minds of many western farmers and financiers are fired with imagination at the thought of making many of the inland cities virtually seaports, and thus causing a great reduction in freight rates.

There is really only one deep water canal, the great Chicago Drainage Canal. This canal is 24 feet deep, over 150 feet wide, and 42 miles long. The most important factor in the matter of water routes in this section is the Great Lakes. These great inland seas, the like of which is found in no other country, are able to carry ships of ocean types and can carry freight at about one-tenth the cost of carrying by rail. By means of the Soo Canals, between Lakes Superior and Huron, and the Welland Canal, in Canada, cargoes can go without change of load from Duluth in Minnesota, nearly two thousand miles inland, to the open sea. The full utilization of the waterways in this section, as in any other section, will go a great way in the cheapening of rates and making possible the development of the industries of the country.

No other region in the United States has such an extensive network of railroads as the Central States. This region is especially favorable for railroad construction and operation. The low watershed around the Great Lakes and the level nature of the interior permit all lines to reach the ports on the Great Lakes and to run out in every direction. Expensive grading, sharp curves, or long bridges over deep cuts are seldom necessary.

Nearly all the larger cities are railroad centers, notably Chicago, Indianapolis, and St. Louis. Chicago is the greatest railroad center in the United States. Here we find the terminus of many lines from the east, as well as those running to the west. Among the eastern lines finding their terminus in Chicago are: the New York Central and affiliated lines, the Pennsylvania, Baltimore and Ohio, and the Nickel Plate. Many of the western lines, like the Chicago and Northwestern, the Burlington Route, the Sante Fe, and the Northern Pacific, connect Chicago with the Pacific Coast. One road running south from Chicago, the Illinois Central, parallels the Mississippi to New Orleans.

This region has also developed electric railways more extensively than any other region. Interurban lines connect almost all of the large cities, particularly in Michigan, Ohio, Indiana and Illinois.

Cities. The most striking change in the United States in the last thirty years has been the great growth of cities. According to the census of 1920, over 52,000,000 people lived in towns and villages of a population of 2,500 or over, and 51,000,000 lived in rural districts or in villages of less than 2,500. In this country, since 1880, the total population of the country has increased over 70%, while the urban population has increased over 200%. Nowhere has the growth of cities been more striking than in the middle western region.

There are five cities in this section with a population of more than 500,000, namely, Chicago, Detroit, Cleveland, St. Louis and Milwaukee; and two between 400,000 and 500,000, namely, Cincinnati and Minneapolis. In all there are twenty-four cities in this middle west area which have a population of over 100,000.

In studying the cities of this region, it is better to take into account the metropolitan districts or economic centers. This would include all of the organized towns which lie near the main city. There are eight districts of high rank, especially from the standpoint of the value of their manufactures. These are Chicago, Detroit, Cleveland, St. Louis, Minneapolis, Kansas City, Indianapolis and Cincinnati. These cities may be geographically grouped as lake ports, river ports and inland cities. In all of them, the factor of accessibility is a potent one favoring their growth.

Chicago, the largest city in this region, with a population of over 2,700,000, is the second city in size of population in the United States. Although it is situated nearly a thousand miles from the seacoast, it is virtually a seaport because of its location on one of the great inland lakes of the Middle West. That a town should grow up at the end of Lake Michigan was seen by many in the early days of the last century. It is a well known fact that wherever people are compelled to pass, or wherever there is a break in the transportation facilities, a town or city is likely to develop. The southward extension of Lake Michigan compels the east and west traffic to go around it, thus determining the location of a great city.

Other factors that have helped in the growth of Chicago are its location in the midst of a rich grain center, near the stock belt of the United States, and also the fact that it is about midway between the Atlantic and Pacific oceans. Such a spot, marking the place where all lines of trade and commerce naturally converge, gives Chicago an unrivaled opportunity for trade and commerce. The supplies of timber, coal, iron, and copper within easy reach of Chicago also make it a seat of manufacturing as well as of trade. This city is a typical example of a city created by economic forces.

The original site of Chicago was unhealthy because of its low situation at the mouth of the Chicago River, but this handicap has been overcome by having the low portions artificially heightened by some eight or ten feet. The city has spread out now so that it borders the lake shore for about forty miles. Although it has an artificial harbor, it is one of the largest shipping ports in the world. Someone has said that Chicago is the western terminus of the Erie Canal.

As a railway center Chicago is second to no other city in the world. A glance at a railway map shows a great convergence of lines into this city. This fact, together with its lake port facilities, enables Chicago to be a great distributor of commodities, and, in part, accounts for the fact that it is the greatest grain and meat market in the world.

The leading industry, slaughtering and meat packing, yields nearly one-fourth of the total value of the manufactured products in this district. Of the industrial products, some of the larger are clothing, foundry, machine shop products, printing, iron and steel cars, and agricultural implements. The rolling mills at South Chicago and the blast furnaces and steel mills at Gary are among the largest in the whole country.

The second city of rank in this district is the city of Detroit. The growth of this city has been most remarkable during the last decade, and today it ranks as the fourth city in size in the whole country. This city was originally established as a military post and a trading center. Although located on a river, it is virtually a lake port and has exceeded the growth of all the other cities in this region, with the exception of Chicago.

Located on the Detroit River, between Lake Huron and Lake Erie, which permits the passage of railroads which connect the Middle West with Canada, Detroit is primarily a crossroads city where the lake route is crossed by the east-west trunk lines of railways. This city is a typical example of a city growing up where there is a break in the mode of transportation.

The leading manufactured output of Detroit is the automobile. In fact, Detroit surpasses all the other cities in the country in the manufacture of this commodity. This city and the city of Cleveland together produce over one-third of the entire output of the United States. It is but natural that this industry should concentrate in the cities of the Middle West, for this section in the early days was the center of carriage making and when this new mode of transportation became developed, it was easy to change to this type of a vehicle.

The other manufactures of Detroit are of a wide variety, but the following should be noted: cars, ships, stoves, drugs, alkalies, tobacco, and matches.

Cleveland is not favored with a good natural harbor, nor is it located on a large stream. The Cuyahoga River is but a small stream. The harbor at the mouth of the river, however, gives safe anchorage for a large number of vessels. Great breakwaters run out on each side of the river, affording a relatively commodious lake port. Its position with respect to other cities and localities has had much to do with its growth and development. A glance at a map will show that Cleveland is located on a direct line between the great ore mines of Lake Superior, and Pittsburgh. In other words, it is the point on the lakes nearest Pittsburgh, which makes this a natural transfer point.

Five great east-west railroads run through this city, making it a prominent railway center. Also there are numerous electric and bus connections, joining this city with other sections of northern and central Ohio. Its prominence as a shipping port is shown by the fact that its lake trade amounts to nearly $2,000,000 annually.

Cleveland, however, is the chief manufacturing city in Ohio, and its manufactures show the effect of the transportation which brings to it coal and iron. Thus, the more important manufactures include iron and steel, automobiles, steel bridges, metal working tools and machines, carriage and vehicle hardware, and gas stoves and ranges. The refining of petroleum is another large industry, made possible by being in the neighborhood of a great oil producing region, favored by pipe-line transportation of the crude oil and water carriage of the refined products.

In this connection, two other cities of some prominence should be noted. Toledo, Ohio, although located on the Maumee River, is virtually a lake port. It has an excellent harbor, the river, gradually widening out into Maumee Bay, gives abundance of room for shipping and wharfage.

Toledo has the disadvantage of being located off the main direct route between the east and west. It is not a direct line between Chicago and the East, and ships from Chicago, Duluth, or Detroit do not stop here on their way to Cleveland or Buffalo. It may, however, be reached by large vessels, and is a favorable point for future connection of Lake Erie with the Ohio River. Toledo is also a large steam and electric railway center.

The principal industries are the refining of petroleum, the making of flour, automobiles, plate and cut glass, besides many machine shops and foundries. Perhaps this city is most distinguished on account of its cut glass works. Some of the finest cut glass in this country is made here.

Another lake port of importance in this section is Duluth. From the standpoint of natural location, few cities have a better site. Located at the end of a great lake, and in the midst of a great grain, ore, and lumber country, this city should be one of the most prominent and populous cities in the nation. The nearness of the Canadian boundary, however, causes Duluth to lose much of the advantage gained by its location, for this boundary turns much of the Canadian commerce from the line of least resistance. Were it not for this fact, Duluth might be a second Chicago. As it is, Duluth is a shipping port for iron ore, grain, and coal, while the manufacturing of lumber, flour, and steel are typical industries.

Milwaukee has grown to be a large center of general industry, although, as a shipping point, it has never gained prominence. It is an outlet for the great state of Wisconsin. Its chief industries are leather and iron.

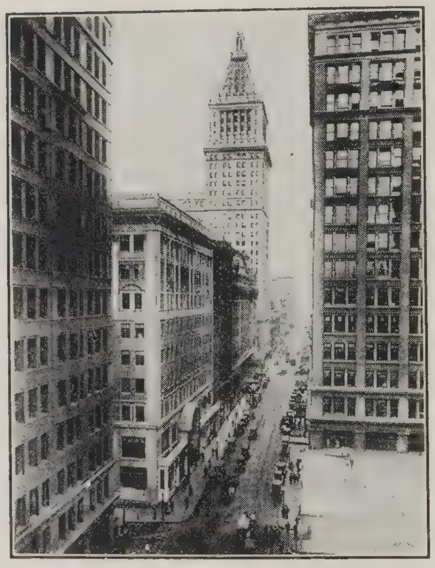
St. Louis, a city near the confluence of three great rivers, the Mississippi, the Missouri and the Ohio, is a result of natural causes. Here is the meeting place of traffic from the east, west, and north. This point easily became a focus for exploration and trade, as water routes from the Appalachians, the Great Lakes, the gulf, and the Rocky Mountains meet here. As a result, St. Louis has been the metropolis of the Mississippi Basin since the very early days.

This city rivaled Chicago as a center of trade and commerce during the first decades of the nineteenth century when the bulk of trade in this region was carried by boat on the Mississippi River. But with the coming of the railroad, river traffic dwindled to such an extent that St. Louis lost much of its early importance as a focal point of transportation routes. The extension of the railways to the Pacific Coast, however, has made St. Louis a railroad center, second only to Chicago. It has, therefore, become a great distributing point for the west and southwest, not only for its own products, but for grain, livestock, cotton, hardware, and agricultural implements. Its industries include slaughtering, meat packing, boots and shoes, tobacco, clothing, iron and steel, chemicals, furniture, and paints.

Minneapolis and its twin, St. Paul, located across the river, were founded at this point on account of the falls and rapids in the Mississippi River. Later, the railroad connections and settlement of the wheat lands to the north and west led to the commercial and industrial growth of these two cities. Numerous railroads connect these two cities with Chicago, St. Louis, Lake Superior, the Pacific Coast, and Canada, thus making these cities accessible to the great markets of the east and west.

Minneapolis is the greatest flour manufacturing city in the world. The tremendous horse power of the St. Anthony Falls and Taylor Falls, in the St. Croix, afford abundant power for these mills, which have a capacity of from 80,000 to 90,000 barrels daily. The natural resources of this section for production and the power from the rivers for preparation of the products of flour and other commodities, are another example of how the geographic environment of a locality affects its economic development.

Kansas City, at the eastern bend of the Missouri where it comes down from the north, is another break in the mode of transportation. In the early pioneer days, this was the river terminus for the overland stages. Its growth, however, is due largely to the development of the railroads. This district is second only to Chicago in the matter of livestock and in the value of its meat products.



(Keystone View Company, Inc., N. Y.)

FIG. 176. FOURTH STREET, CINCINNATI

Other cities located on rivers are Omaha and Cincinnati. The former is noted particularly as a meat-packing center, while the latter has a wide variety of manufactures, such as clothing, boots and shoes, wagons, soap, and artistic pottery.

Of the cities that are strictly inland, the most important is Indianapolis, the capital of Indiana. This city was located largely by act of the legislature, it being about the center of population for the state. It has the advantage of being located near the coal region and in the midst of a very rich agricultural region.

Perhaps the factor that has developed Indianapolis more than any other is the steam and electric railroads. In no other state does the capital city have so great an economic influence as does Indianapolis in the state of Indiana.

TEXT QUESTIONS

1. How has the topography of the Middle West aided agriculture and commerce?
2. Where is the wheat belt? The corn belt?
3. Name and locate two lake ports, two large river ports, and two inland cities in this region.
4. What city is noted for the manufacture of each of the following commodities: agricultural machinery, rubber, cash registers, furniture, iron and steel?
5. Name five cities in this region noted for the manufacture of automobiles.
6. What are the reasons for the predominance of the meat packing industry in this region?
7. Where are the principal iron mines of the Middle West? Why are they so valuable?
8. Locate the following cities and explain the importance of each: Dayton, Milwaukee, Indianapolis, Duluth, Gary, Cincinnati, St. Louis.
9. What cities other than Chicago are important as meat packing centers?
10. How many cities in this region have a population of over 100,000 inhabitants?
11. On an outline map of the United States draw a line representing the approximate location of the 100th meridian of longitude. Why is the eastern portion of the states through which it passes more densely populated than the western portions?
12. Where are the principal iron ore mines of this region? What cities are noted for their blast furnaces?
13. Discuss the likelihood of Chicago becoming the largest city in the United States.
14. How would the proposed St. Lawrence waterway benefit this region?

SECTION 5—THE WESTERN STATES

In General. In discussing the economic geography of the western states it is perhaps best to consider all the territory lying west of the 100th meridian of longitude. This is a gradually rising plain which extends some twelve hundred miles to the Rockies, and after that range come a series of ranges until the coast is reached. All of this section, with the possible exception of the strip along the northwest coast of the United States, might be called the land of little rain, for the most of it has less than 20 inches of rainfall per year, and some areas have under 10 inches per year. The high altitude and lack of rainfall coupled with high winds make a large portion of this region a virtual desert.

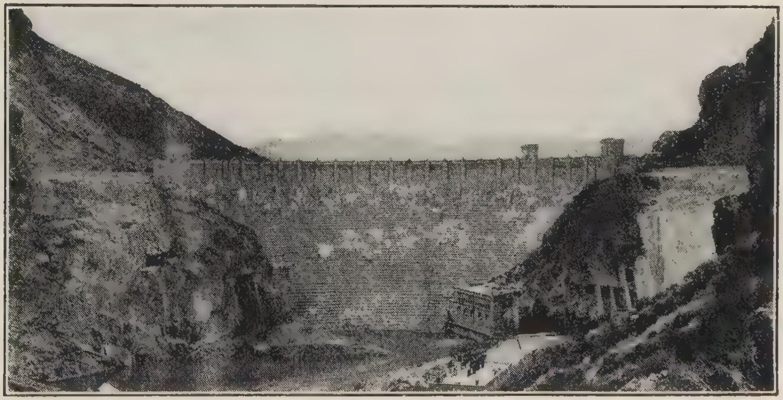
Climate and Soil. The climate of the eastern section of this area is of an extreme continental type, very hot in summer and cold in winter. In the extreme northwest, one finds a comparatively warm climate both winter and summer. The climate of this region more nearly duplicates that of the British Isles than any other section of continental United States. Southern California, however, has a subtropical climate with almost rainless summers. In fact, irrigation is needed for most of the farming done south of San Francisco.

In the eastern section and on the high plateau of this region, are the great sheep and cattle ranges of the country. Cattle raising has been somewhat curtailed by the westward movement of sheep raising. The close cropping of the grass by sheep does not leave enough for cattle to subsist upon, and in many instances, has changed a grass growing region into a sand blown region. This is at least one reason for a decline in cattle raising and partially explains the rise of the price of meat.

In the northwest region, dairying is carried on to a considerable extent, especially in sections of the country near the large cities, where land is not fertile enough to make the growing of staple crops more profitable than this type of farming. Farther south along the Pacific Coast near

San Francisco, is the greatest poultry district in the world, while still farther south, fruit growing is carried on to great advantage.

Irrigation. The conditions in this section of the country have been serious drawbacks in the development of agriculture. Most of this region has been considered too dry to attempt to raise crops of any kind. In fact, the thing that attracted the early settlers to this region was its mining resources. As the country began to grow more populous, the necessity of growing more food in this region became more and more apparent.



(Photograph by Ewing Galloway, N. Y.)

FIG. 177. ROOSEVELT DAM, ARIZONA

The power house produces 16,000 H. P., while the waters behind the dam irrigate 300,000 acres.

The thing most needed to make gardening and agriculture possible was water; hence, the process of irrigating the land has developed in this region to quite a wide extent. Here is a great opportunity for irrigation, as it is estimated that at least fifty millions of acres, situated in the valleys and along the foot of the mountains, are capable of being irrigated.

Irrigation, or the application of water to land, has been practiced since very ancient times by peoples dwelling in dry lands. The Indians of Arizona and New Mexico practiced it in this country before the coming of the white man. The first white people to practice irrigation in this country were the Mormons in Utah. Here, conditions were ideal for this method of watering the land, as there was an inexhaustible supply of water furnished by the melting snows from the mountains, while the topography of that region afforded a level area suitable for water distribution.

The arid and semi-arid territory of the United States includes nearly all of the states of Arizona, Nevada, and New Mexico, and portions of California, Colorado, Idaho, Kansas, Montana, Nebraska, North Dakota, Oklahoma, South Dakota, Texas, Utah, Washington and Wyoming. Irrigation is practiced to a greater or lesser extent in all of these states.

In that part of the United States lying east of the arid and semi-arid states named above, the normal annual rainfall exceeds twenty inches, and is so distributed throughout the year as to provide sufficient moisture for the growing of general crops. While droughts, of short duration, occur in this section sufficiently often to make desirable the irrigation of such crops as truck and small fruits, which may be seriously damaged by lack of rainfall at certain periods, it is not a general practice. General crops sometimes suffer from insufficient moisture, but these conditions do not occur often enough to warrant the expense of irrigation.

Value of Irrigated Land. Irrigated land, in many ways, is much more valuable than other kinds of agricultural land, largely for the reason that it contains so much of mineral plant foods and fertilizer in solution. These important ingredients have not been washed out by rains as in other land, and hence retain a large amount of natural food. Best of all is the fact that the farmer can always have just the right amount of water for his crops and does not run the risk of drought or too much rain, either of which is the bane of the average farmer in the Middle West.

Government Aid. In 1902, the government of the United States took notice of the fact that it must coöperate with the individual if irrigation was to be carried on in a profitable manner. Up to this time, most irrigation had been carried on by individuals, but the limited area that could be watered made this an expensive operation for those concerned.

Congress passed the National Reclamation Act in 1902 which provided that the money derived from the sale of public lands in the arid states should constitute a fund for the reclamation of dry land through the process of irrigation. The government undertook to furnish the water supply, and the cost of the project was assessed against the land and paid by the settlers in equal annual installments. As a result, a large number of these projects were put under way, many of which have at this time been completed and taken up.

In 1927 over twenty million acres were actually under irrigation, out of the total of nearly thirty-six million acres included in irrigation enterprises. The land under irrigation in the year 1927 showed an increase of about twenty per cent over the acreage in the year 1920.

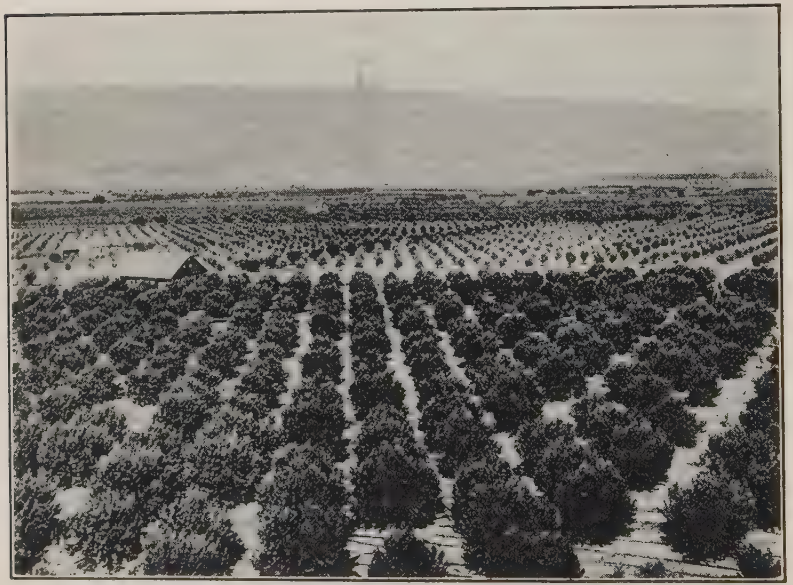
The total capital invested in irrigation enterprises in 1927 was over $700,000,000. Of this amount twenty-two per cent was invested by individual and partnership enterprises, twenty-six per cent by cooperative enterprises, twelve and one-half per cent by irrigation districts, four and one-half per cent under the Carey Act, twelve and one-half per cent by commercial enterprises, eighteen and one-half per cent by the United States Reclamation Service, and the remainder by miscellaneous agencies.

Irrigated Regions. The important irrigated regions according to drainage basins are as follows:

1. The northern half of the Great Plains, extending from the Rocky Mountains toward the Mississippi River, is drained by the Missouri River and its tributaries. In most of this area, some crops can be grown without irrigation, and the irrigated land is confined almost exclusively to the

valleys. The Missouri itself is not very largely utilized, and many of its tributaries are in the same condition.

Included in this basin is the Shoshone project in northwest Wyoming. The water supplying this project is furnished by the Shoshone River, which runs through a deep and narrow canyon into the Big Horn River, a tributary of the Yellowstone River. On this river is constructed a huge masonry dam over 328 feet high. This project serves about 100,000 acres of land.



(*Photograph by Ewing Galloway, N. Y.*)

FIG. 178. AN APPLE ORCHARD IN A SAGEBRUSH REGION RECLAIMED BY IRRIGATION

Another notable development is located on the Cheyenne River and its tributaries (including the Belle Fourche). This project irrigates over one hundred thousand acres of land in western South Dakota. The location is splendid in regard to markets, located as it is near the mining towns of the Black Hills, as well as within striking distance of the great cities of Omaha, Minneapolis, St. Paul, and Chicago.

2. The North Platte supplies large areas of Colorado,

Wyoming, and Nebraska. In 1920, 1,600,000 acres were included in the irrigation enterprises on this river and its tributaries. Because of the level nature of the land, the farms are divided into holdings of about eighty acres. This is larger than the average irrigated farm, which seldom runs over ten or twenty acres, on account of the rugged nature of the surrounding country which limits the amount of available land.

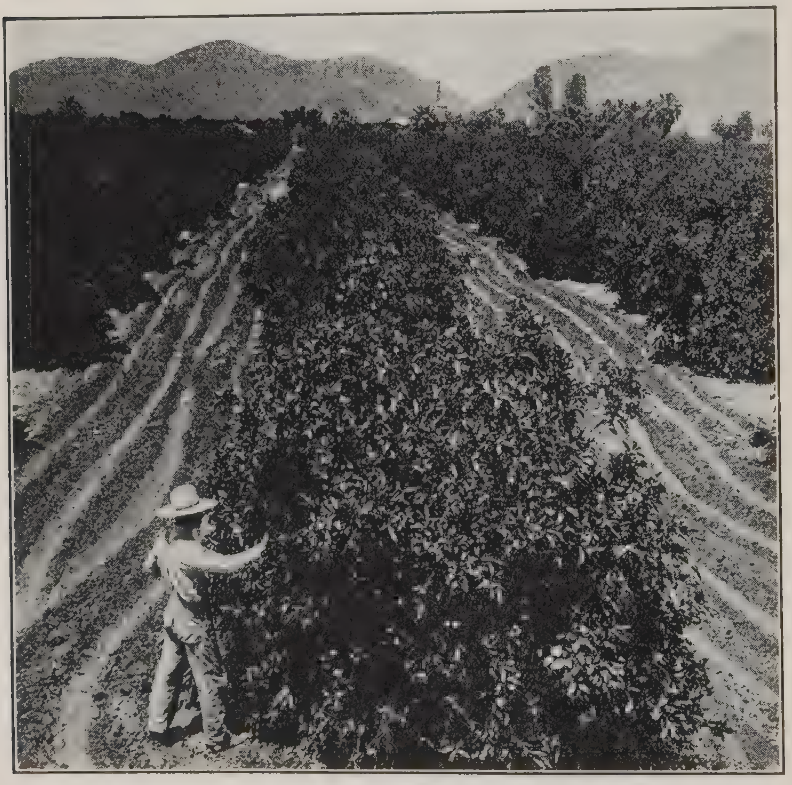
3. The central part of the Great Plains is drained by the Arkansas River and its tributaries. The Arkansas waters a large area in Colorado and a small area in Kansas. In 1927, a total of 1,000,000 acres was included in the territory which the enterprises in this section were capable of irrigating. Of the total possible irrigated acreage, approximately 900,000 acres were irrigated in 1927.

4. The Rio Grande and its tributaries drain south central Colorado, most of central and eastern New Mexico, and the southwestern part of Texas. This large area lies largely in Colorado and Texas, with a considerable portion in New Mexico. The Rio Grande is subject to heavy floods, and at times is dry, or nearly so, and storage is necessary for permanently successful irrigation. The river is dammed near Eagle, New Mexico, forming the Elephant Butte Reservoir, which has sufficient capacity to store the flood water and to regulate the flow of the stream below. Water from this reservoir supplies about 180,000 acres of land in a strip forty miles wide on both sides of the stream in New Mexico, in Texas, and in Mexico.

5. The Gunnison project is in western Colorado, where a large water supply was obtained by tunneling under a mountain range, 2,000 feet high, to feed the Uncompahgre Valley. This region opened over 140,000 acres for productive agriculture.

Near the mouth of the Colorado, very large areas are irrigated in Arizona, California, and Mexico. The Yuma project has a most favorable situation. It is situated on the delta of the Colorado River, in the states of Arizona and California. The soil of this region is very rich in plant food and will prove one of the richest projects. It is estimated that a farm of ten acres will be sufficient to support a family.

On account of the warm climate, of a sub-tropical nature, and the fact that this section is practically frost free, more than one crop can be raised, thus doubling the income per acre. Over one hundred thousand acres of land is under irrigation.



(*Photograph by Ewing Galloway, N. Y.*)

FIG. 179. IRRIGATED GRAPE FRUIT ORCHARD, ARIZONA

The Roosevelt dam is located just a little south of the central part of Arizona. It is 284 feet high, 1,080 feet long, and 170 feet thick at the base. The water is easily distributed over the entire section which comprises between 250,000 and 300,000 acres. The climate of this section is very favorable to the growing of grapes, almonds, dates, and other warm country products.

6. North and west of the Colorado River basin lies the Great Basin which has no outlet to the sea.

The "sinks" in western Nevada receive water from both east and west. Humbolt River and its tributaries drain most of the eastern slope of this basin.

Truckee River is the outlet of Lake Tahoe, which lies on the border between California and Nevada. Plans for using Lake Tahoe for a storage reservoir have been made. Water from both Truckee and Carson Rivers is stored in Lahontan Reservoir in Nevada.

7. North of the Great Basin and extending from western Montana and Wyoming to the Pacific Ocean is the Columbia River Drainage basin, in which there were nearly 7,000,000 acres included in irrigation enterprises in 1927.

Snake River rises near the headwaters of the Missouri and Colorado in northwestern Wyoming, and waters land in Idaho, Oregon, and Washington. Its low-water flow is all used, and storage has been provided for much of the flood water in Jackson Lake, Wyoming, and in reservoirs in Idaho. There is still a large volume of flood water available for storage, and plans are being made to provide reservoirs to store this water.

In California the San Joaquin and its tributaries supply water to the larger part of the irrigated land in that state.

In the San Joaquin Valley, irrigation has brought the ground water near the surface, and a great many wells and pumps have been put in, in some instances to furnish a supplemental supply of water when streams are low, and in others to provide the entire water supply.

Taking the western part of the United States as a whole, with few exceptions the low-water flow of the streams is exhausted, but there is a very large supply of flood water available for storage. There is no lack of tillable land on which this water can be used.

Future extension of irrigation depends on whether economic conditions are such that the value of the crops which can be produced will justify the expense of storing the flood waters. The same may be said of the use of ground water. The extent of the supply of ground water is not so well known as the amount of flood water, but there are many places where water can be obtained from wells when the expense of pumping is justified.

Economic Value. Many different crops will grow on these irrigated lands, illustrating the varied climate of the United States. For example, hay, grain, and vegetables will be the staple crops of the northern enterprises, especially in Montana, Wyoming, the Dakotas, and Nebraska; in Idaho, Washington, Oregon, and California, the principal crops are apples, peaches, pears, and plums; while in the warmer southwest, the sub-tropical fruits can be grown to profitable advantage.

The high value of the land will encourage intensive tillage, and the ever present problem of labor will tend to make most of these farms small enough for one man to work. In the orchard growing sections, the holdings of each individual does not run over five or ten acres. This will mean a more dense rural population, especially for the irrigated lands, and will perhaps overcome the distaste of many to take up agriculture on account of the isolation which it has always meant.

It is thought by many that irrigation of lands may have the effect of building up farm villages, patterned somewhat after the old manorial villages of England and Europe, minus the allegiance to some overlord. Thus farmers can congregate into one place where schools, stores, medical attendance, and churches can be maintained on a high level, while the outlying land could be worked during the day by the individual owners.

Dry Farming. In places where irrigation by water stored up in reservoirs cannot be used, either because of distance from the supply or cost of such a project, and where there is at least ten inches of rainfall per year, a different type of farming has developed. This is known as dry farming, and the crops of this type of agriculture are naturally of a drought resistant species, especially kafir corn, sorghum, millet, alfalfa and durum wheat. This latter crop is of special importance and forms a considerable part of our wheat crop.

This type of farming is carried on by storing the rains of two winters in the soil. In the region west of the Rockies, the rain falls chiefly during the winter season. The soil of this region is underlaid by clay, which is almost impervious to water. The rain of one winter is allowed to fall on the land, and then to prevent evaporation during the following summer, the entire plot is covered with any kind of material which will keep the wind and sun from reaching the soil. At the beginning of the second winter this covering is removed and another season's rain falls; thus, the land has the larger part of two seasons' rain stored and is ready for cultivation the following summer.

(Courtesy U. S. Department of Agriculture)

FIG. 180. WHEAT BINDING IN A DRY FARMING AREA

Under such conditions it is possible to grow durum wheat and some other staples like alfalfa, which have a long root running far down in the soil. Dry farming is another excellent example of the effect of land and climate on the nature of products grown.

Agriculture. This region cannot be called very important economically as a farming section. The ruggedness of the soil and the climate have been barriers that have been difficult to overcome. The fact that mining has paid larger returns than farming also helps to account for the unwillingness of individuals to take up agriculture. Hence, we find that very little is exported from this region except fruits and hops.

The farmers on all parts of the Pacific slope have turned their attention largely to fruit growing, so much so that the apples and other fruits of Washington and Oregon are considered to be unequalled in the markets of the East. The different climates of this region enable the farmers to grow both temperate and sub-tropical fruits; peaches, pears, and plums coming from the temperate regions, and oranges, olives, lemons and figs from the southern sections.

Considerable grain is grown on the Pacific slope, especially in the states of Washington and Oregon. The dryness of the summers in this region enables the farmers to cut, thresh and sack their grain on the same day. Very little of the grain in this region is exported, however, largely because of the high freight rates on such heavy commodities as wheat.

Mineral Products. It is in mineral products that this western section abounds. In fact, minerals were the cause of its first settlements. Man will go anywhere for gold, from the cold, bleak mountain passes of the arctic Klondike region to the hot, burning plains of Australia. It is the one magnet that will attract him to the most uninhabitable regions of the earth. This Rocky Mountain region never could compare, as a dwelling place, with the rich farm lands of the Middle West or even the farms of the East. The only reason that settlers first came to this region was the search for gold. Gold is still the principal mineral of the Pacific slope where it is to be found principally along the foothills of the Sierras.

Coal is scattered throughout this region, principally in Washington and Colorado. There are also beds of anthracite coal in Colorado and New Mexico. Lead and zinc are mined to considerable extent in Idaho. Copper is also found in abundance in the states Arizona, Montana and Utah. Butte, a city in Montana, is the greatest copper center in the world. Iron ore is widely distributed in Colorado. In the matter of smelting iron ore, Colorado is the leading state west of the Mississippi.

Important fields of petroleum have been discovered in the extreme Southwest. The fields of southern California are among the most productive in the world. The principal center is around Bakersfield, in that state. The importance of this fuel is shown in that it affords a fuel for the railroads, which are located so great a distance from the coal mines. The output of this mineral fuel in California is now of greater value than the output of gold.

Of other important minerals, mention should be made of the asphalt beds in California and Utah; salt from the dried sea regions of California in the Salton Sink; and borax from the Death Valley in the Mojave Desert. Even precious stones like turquoise, sapphires, and topaz are found in New Mexico, Arizona and Montana.

(Courtesy U. S. Forest Service)

FIG. 181. A FOREST IN CALIFORNIA

Forests. A great part of the wealth of this region is in its forests. This region has, in the main, supplanted the Michigan field as the source of supply of much of our timber. The yellow pine of the country furnishes for the most part the timber for use in the various mines. In the Puget Sound region is the center of the Douglas fir and cedar. The northern Pacific slope contains the largest body of standing coniferous trees in the United States.

Manufactures. One does not find in this region manufacturing of a national type. Most of the products manufactured here are for home consumption. Here is plenty of power and raw material, but the supply of labor is lacking and the markets are too remote for industry to develop on the same large scale as in the Middle West, South or East. Such manufacturing as one finds here is largely of articles for the smelting of ores, which is prominent in Butte and Seattle; steel and iron in Colorado; shipbuilding in San Francisco; and mining machinery in Los Angeles and Denver. Lumbering is, of course, the chief industry in Tacoma, Portland and Spokane; flour milling in Stockton and Sacramento: and the refining of Hawaiian and California beet-sugar in San Francisco. The fact that this region is somewhat isolated, due to the high cost of shipping, enables industries here to compete with the industries of the East.

Transportation Facilities. The commercial development of the West is due, in a great measure, to the railroads that have found their way through the passes and over the mountains to the coast. These roads, in fact, have been the very life of this section in connecting it with the eastern sections. Were it not for the railroads of this region, it would have been many hundred years before this section would be settled and developed to the extent it is. Its very topography is such, that railroad building is an expensive operation, which accounts for the paucity of roads as compared with the more level section to the east.

Six transcontinental railroads now connect the Mississippi Valley with the coast. These lines are essential to the commercial development of the West. The first line to be built was the Union Pacific, built in the sixties, from Omaha in Nebraska to Sacramento. The Missouri Pacific, joining with the Denver and Rio Grande and Western Pacific, offers a continuous route from St. Louis to San Francisco. The longest line to the west is the Santa Fe, which follows the old Santa Fe trail through the southwest to San Francisco.

The shortest of the Pacific lines is the Southern Pacific, running from New Orleans and Galveston to Los Angeles and San Francisco. This is the one line that enters the city of San Francisco proper, all other lines finding their termini in the cities across the bay. Two great railroads parallel each other in the north. One of these is the Northern Pacific, which connects Minneapolis and Duluth with the west, and the other is the Great Northern.

Cities. The natural conditions in the interior of this western region are unfavorable to the existence of large cities. With the exception of Denver and Salt Lake City, most of the large centers of population are on the Pacific slope.

In this entire section in 1927 there were only eleven cities having a population over one hundred thousand, namely Los Angeles, San Francisco, Seattle, Portland, Denver, Oakland, Salt Lake City, Spokane, Long Beach, San Diego and Tacoma. In four of the states, there was no city of over 25,000 population, namely, Nevada, Wyoming, Arizona and New Mexico. This small population is due in part to the inaccessibility of the region and to climate, especially in the dry regions. Without doubt, lack of water will be a barrier to this section in becoming as populous as those regions to the east and south. The density of the population varies from less than two per square mile, in a state like Nevada, to from 45 to 90 per square mile on the Pacific slope.

In the interior, the city of Denver is the most prominent commercially. This city originated as a placer mining camp and is now the chief commercial center for the entire Rocky Mountain region. It has a population of over 200,000; nine railways enter it, three of which are continental. It is a center for grain, slaughtering, meat packing, and the smelting and refining of lead.

Another city of the interior is Salt Lake City. This is one of the few artificially founded cities in the United States. Its origin was due to a religious movement. It had the good fortune, however, to be located on the direct line followed by the gold seekers in the middle of the last century, and hence it became a center for outfitting these adventurers. Its population in 1920 was 118,000. It is the business center for the irrigated region of this section. It is also the market for the sheep husbandry of the Great Basin.

Another city of some industrial importance is Butte, in Montana. This city owes its prominence to its copper mines and smelteries. It is said to be one of the richest cities per capita in the United States.

It is on the Pacific slope where we must look to find the greatest cities. This region, with greater accessibility from the west and a better rainfall, is a more popular habitation for man. The metropolis of the coast is the city of Los Angeles. This city has grown remarkably during the first quarter of the twentieth century. It is the fruit center of southern California, the country around being irrigated by means of artesian wells. Another industry that has centered in and around this city, on account of its climate, is the moving picture industry.

San Francisco, with about 600,000 in 1928, the second city in size in this region, is located on an excellent harbor, but unlike New York, its hinterland is limited by the mountain barriers only a few miles to the east. Ten railway lines reach the bay, however, and here, as in New York, we find regular steamship lines to foreign ports. The principal lines carry our commerce to Mexico, South America, Hawaii, the Philippines, Japan, China, Australia, and New Zealand. The commercial possibilities of this city would become greater if the people of the Far East should ever develop to the extent of the Europeans, who are opposite our Atlantic shore.

Going farther north, we come to a rapidly developing section around Puget Sound. The metropolis of this section is Seattle, which bids fair to become a vigorous rival of San Francisco in the struggle for trade supremacy with the Orient. Seattle has the advantage of being nearer to the ports of the Orient than its rival farther south. This is because it is farther north and in a more direct line with the steamship routes which take a northerly course to Asia. Seattle also has an additional advantage of being located nearer to Alaska, which should give it a big market for its manufactured goods when once that territory becomes more fully developed. Its principal industry is flour milling.

Tacoma, also located on Puget Sound, shares with Seattle some of the advantages above mentioned. It is chiefly concerned with the lumber industry.

Portland, on the Willamette river, the second city, is in Oregon and has transcontinental connections with the East. It is the commercial center for the Oregon forests and the Columbia River fisheries.

Spokane, an inland city, is in a center of grain growing. Two great continental lines converge at this city, giving it excellent transportation facilities.

Only a small portion of the foreign commerce of the United States goes through the Pacific Coast ports. According to statistics recently available, only about six per cent of the nation's commerce reaches this side of the country, and of that about one-half goes through the city of San Francisco. The tonnage of the Puget Sound ports is greater, but it is less in value than that of the more southern port. Trade, however, is certain to increase on this coast as it faces an ocean, around which at least half of the people of the world live. As western ideas of trade become fully adopted and the wants of the Oriental peoples increase, the commerce of this region of the United States may not long continue inferior to that of the eastern seaboard.

Some four hundred and eighty miles south of San Francisco is located the city of Los Angeles. Its rapid growth has caused the city limits to reach the coast, so that today Los Angeles is considered an ocean port. It is in a region containing silver, lead and gold mines and petroleum wells. Its most noted industries are the making of moving pictures and mining machinery. Its fine climate has attracted many people of wealth and culture.

TEXT QUESTIONS

1. What are the chief characteristics of the climate and soil of most of the western region?
2. What is meant by irrigation?
3. How has the government aided irrigation?
4. Locate five irrigated regions in the western states.
5. Why are irrigated lands so valuable?
6. Explain the term "dry farming."
7. How does climate aid wheat growers in the northwest?
8. What three western states are important producers of copper?
9. Locate the following cities: Spokane, Los Angeles, Salt Lake City, Seattle, San Francisco.
10. What advantages has this region for manufacturing?
11. What is the character of the manufactured products of the West?
12. Name four transcontinental railways connecting the Mississippi Valley with the Pacific Coast.

SECTION 6—POSSESSIONS OF THE UNITED STATES

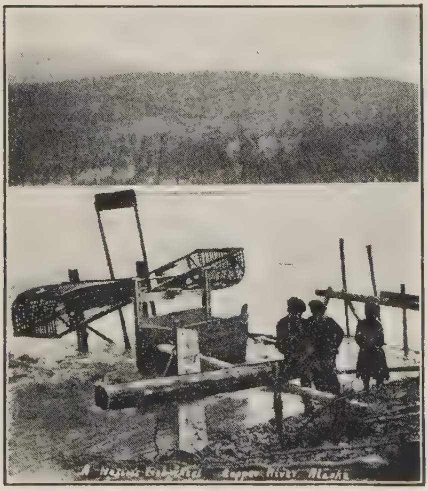
Alaska. This great territory, in the far northwest portion of the North American continent, has been little understood, and too frequently slandered as a place of barren arctic sterility. This territory is in about the same latitude as Scandinavia, and in places, has about the same kind of climate. According to records kept by the weather bureau, the thermometer at Sitka has a winter average of only 32.5 degrees Fahrenheit, which is practically the same as that of Richmond, Virginia.

This mild, equable climate is peculiar to all the country along the coast line, west of the mountain ranges. This region is tempered largely by the warm winds blowing off the ocean. In the high interior, the climate is drier and of a most intense temperature both winter and summer.

It is the size of Alaska that astonishes the average person, for looking at the map its shape is such as to conceal its true extent. In actual square miles, it is nearly the size of the eastern section of the United States from the Mississippi River to the Atlantic Ocean, and in length of coast line, it exceeds in mileage that of continental United States. The northerly latitude of this territory, with its long hours of sunshine, is most conducive to the growing of agricultural products. The sun shines from 18 to 24 hours per day in many places, thus enabling crops to mature in a shorter time than in the more southerly latitudes. For this reason barley, potatoes, cabbages and turnips have ripened here as far north as Fort Yukon, in latitude 66 degrees north.

Alaska was noted, first of all, for its supply of furs. Here was a natural ground for fur-bearing animals and considerable wealth has been derived by this colony from this commodity. It is still of some importance. The fur industry is, however, being carried on along more scientific plans at present, for it was seen that the supply of fur-bearing animals would soon be extinct if the wasteful methods of hunting and trapping of the nineteenth century should be followed. As a result, many fur farms have been established, especially farms breeding the black and silver fox. Excellent facilities for this type of farming are to be found on many of the islands off the coast.

No waters are more abundantly supplied with fish than the waters of the Alaskan rivers and coasts. From the standpoint of value, these fishing grounds are among the most valuable in the world. Here is a section, from which is received over fifty per cent of the salmon used in the United States. Huge canning factories of salmon form an important industry along the seacoast. Other fish, caught in large quantities, are the halibut, the cod and the herring. The catches of these latter fish could be greatly increased. This region is capable of greater development along this line as the resources have scarcely been touched.



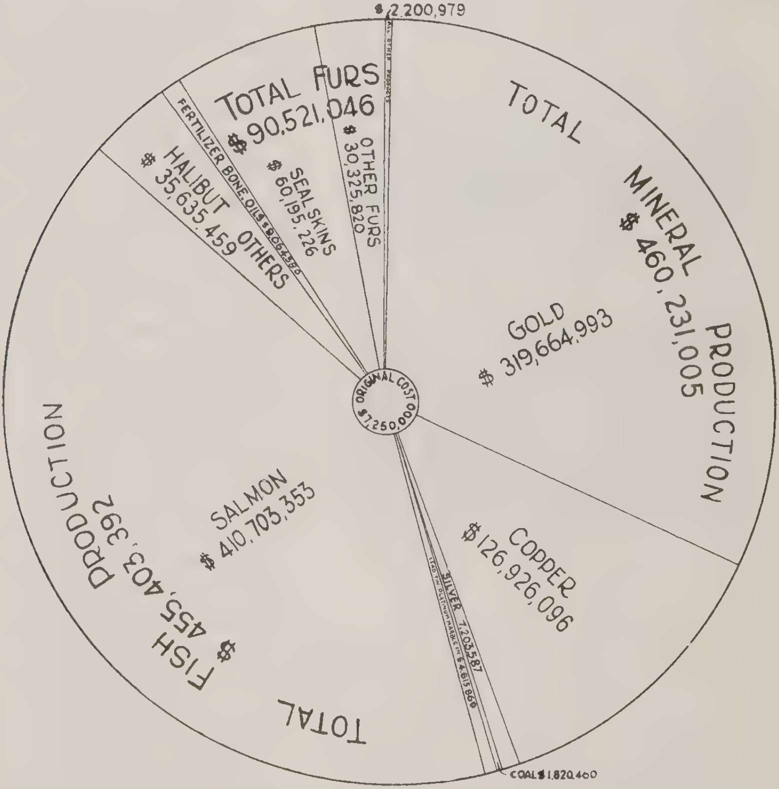
(Keystone View Company, Inc., N. Y.)

FIG. 182. A NATIVE'S FISHING WHEEL, ALASKA

Another of the rich resources of this region is its supply of timber. Most of the heavy forests stretch along the moist coast line of the southeast. This region is really an extension of the forests in British Columbia and is well supplied with coniferous trees. Some timber is found in the interior, especially along the water courses.

The lower courses of the Yukon are almost all wooded. This timber, however, is too small for lumber and has no great value except as it is available for use as paper pulp. The forests of this region are not as fully developed as they could be, largely on account of their inaccessibility, many of the best sources of supply being located too far away from water transportation. Only those that are located near ports that can be reached by boats have real commercial value.

As in the case of the western states, the supply of gold in this region is the cause of attracting most of the settlers. The rush to the Klondike and Alaskan regions in 1897 to 1899 was equalled only by the rush of gold seekers to California in 1849. This precious mineral is scattered over a wide area.



(*Keystone View Company, Inc., N. Y.*)

FIG. 183. ALASKA'S PRODUCTS IN 1867-1920 WERE $1,008,000,000

The principal fields are located in western Alaska along the Yukon River, and in the Seward Peninsula, near the city of Nome. There are other important fields below the Yukon River, stretching towards the coast. The principal ones are those located near the Cook Inlet and Prince William Sound.

Gold furnishes the chief article of export from this region, representing over 45 per cent of the export trade.

At the present time, the mineral resources are Alaska's chief wealth. Here are vast untouched coal fields of both bituminous and anthracite variety. The only thing lacking to utilize them further is transportation, as most of the coal beds lie in the interior.

There are also large deposits of copper on the Prince of Wales Island and in the region north of Cook Inlet. These deposits are very rich and are becoming valuable commercially, due to their accessibility. Another mineral of considerable importance is tin. This mineral is found in large quantities on the Seward Peninsula, north of the city of Nome.

The commercial value of Alaska consists in her raw materials. Her chief exports of gold, salmon, and furs will constitute her chief source of wealth for some time to come. Agriculture will probably never develop beyond the home consumption stage.

There has arisen, however, an important industry there that may prove to be a most important factor in increasing the supply of food for this region, as well as furnishing an excellent article of export. On the barren moss grown tundra or plains, the government placed a number of reindeer some few years ago. The reindeer can thrive in this locality and is not only important as a food supply, but can be used as a beast of burden. The herd of reindeer has increased to such an extent that large meat packing houses have been erected in the vicinity of Nome. In the year 1920 over six thousand reindeer carcasses were shipped to American markets through Seattle.

The great lack in this territory is in transportation facilities; dog teams are the most common means of transportation both in summer and winter. There are not even good roads for the passage of wheel vehicles, except in the immediate vicinity of settled areas.

The lack of roads is a serious factor in the full development of this region, and causes most of the rich deposits of copper, gold and coal to remain undeveloped. Some development along this line has been started and there are a number of short routes near mines in the Seward Peninsula. One road extends from the southern coast to the interior at Fairbanks, on the Tanana River. This should prove to be a most important road, as it opens up a region rich in gold, copper and coal.

The cities of Alaska are small in number, as well as in population. The chief places of commercial interest may be mentioned briefly. The principal town on the Seward Peninsula is Nome. This town is located amidst the rich copper and gold mines of this region. There is also excellent cod fishing to be had along the coast. Another city of importance is St. Michael, located near the mouth of the Yukon River. This city is located near large coal fields which stretch back to the Yukon river.

Skagway is, however, the chief city in Alaska and is important in that it offers the shortest route to the navigable waters of the Yukon district. Two cities, or settlements, on the southern coast have important positions, being located on ice free harbors. They are Cordova and Seward. These places are connected by rail with the interior and also located in a section favored in deposits of gold and coal.

Porto Rico. Porto Rico is an island about ninety-five miles long and about thirty-five miles wide. It is somewhat smaller than our state of Connecticut, and, because of its rich fertile soil, is one of the most densely populated islands in the West Indies. The climate is tropical, though the elevation in certain portions furnishes a climate that makes an excellent dwelling place for the white man. The chief commercial products of this island are coffee, sugar-cane and tobacco.

For a long time, coffee was the principal crop, but of late years, there has been a tendency to grow more and more sugar-cane by planters who buy up vast tracts of land and allow it to be worked by a plantation system with negro labor. The growth of sugar-cane farming has had a tendency to squeeze out the small white farmer and increase the negro or black population. The chief exports of this island are sugar, coffee and tobacco; and its chief industries are limited to the refining of sugar-cane, the manufacture of cigars, cigarettes, and Panama hats.

The Philippines. This large archipelago of over three thousand islands near the coast of Asia forces the United States to take an interest in the affairs of the Far East. About 100,000 square miles of land were added to the sovereignty of the United States when these islands were purchased from Spain. While most of the islands have a tropical climate unfit for the white man, yet in the northern section, especially on the island of Luzon, the climate is temperate and here we find most of the tilled land and large cities.

The principal commercial products are its raw materials, the chief of which are sugar-cane, tobacco, cocoanut, and the famous Manila hemp. The last product is used in the making of ropes. Over half of the land in these islands is covered with forests of many valuable tropical woods. Of chief commercial importance are rubber, gutta percha, dye woods, and bamboo. Bamboo is used largely for building purposes.

These islands are also rich in mineral resources. In the northern islands we find gold and copper in considerable quantity. Here also are rich iron deposits, located near coal, that are beginning to attract capital and will prove an important factor in the industrial development of this region.

Like Alaska, this region lacks transportation facilities. As a consequence, most of the people are near the coast. Some building of railways, which already has brought considerable wealth to the people in the interior, has been carried on since American occupation. As transportation facilities are provided, more sugar and coffee can be raised; the rubber districts can also be tapped; and these commodities, which are in so great a demand in this country, will bring a vast amount of wealth to these islands.

The bulk of trade is carried on with this country. In the year 1926, 46 per cent of her imports came from the United States. Manila, situated on the northern island of Luzon, is the principal port for foreign trade. It has an excellent harbor and is situated in the path of many commercial routes from North and South America to the Orient.

Hawaiian Islands. Located far out in the Pacific Ocean at the crossroads of the ocean traffic, this little group of Hawaiian islands forms a most important possession of the United States. It not only furnishes an important mid-ocean supply station, but, in a sense, is the western gateway to the Panama Canal. The population of these islands is largely Asiatic, due, in most part, to the demand for cheap labor on the sugar plantations.

The great commercial crop of these islands is sugar. This is grown everywhere on the lower elevations. Sugar makes up about 90 per cent of the entire exports of the islands. It represents a value of something over $60,000,000 annually. Other prominent crops are pineapples, cocoa, bananas, vanilla, and rubber, which are found in the moist regions, while coffee and tobacco grow in abundance in the higher and drier regions.

Pineapples are a most important crop for export. Over $3,500,000 worth of this fruit was exported to the United States in 1927. Some of the largest canneries in the world are located on these islands, consuming many hundreds of tons of fruit per day.

Other Possessions of the United States. Far away in the Pacific Ocean, there are two groups of islands belonging to this country. They are not large nor are they great producers of commodities, but they lie in the way of many of the commercial routes in the southern Pacific. These islands are the Samoa group and Guam. Their chief value at present is their use as coaling stations for the navy.

In the Caribbean region, the Virgin Islands, located just east of Porto Rico, were purchased in 1917. They, too, are important chiefly as coaling stations and as guardians of the eastern gateway to the Panama Canal.

On the Isthmus of Panama, the United States has control over a strip of land ten miles wide on either side of the Panama Canal. This is known as the Canal Zone. It would be hard to overestimate the commercial value of this strip of land to the United States. The steamship route from New York to San Francisco has also been shortened thousands of miles by the canal, and this fact will go far toward stabilizing freight rates on railway traffic between those two cities. It has also shortened the distance between New York and the Orient, and between the western coast of South America and the Atlantic ports of North America. This means that freight rates are appreciably lessened. The bringing of New York and the Atlantic seaboard nearer to the Orient also means that these cities are in a better position to compete with London and other cities of Europe for the trade of the Far East.

TEXT QUESTIONS

1. What agricultural crops are grown in Alaska?
2. In what does the mineral wealth of Alaska consist?
3. What meat packing industry is developing in this region?
4. What is the chief method of transportation in Alaska?
5. What are the two important export crops of Porto Rico?
6. Name the chief commercial products of the Philippines.
7. Why are the Hawaiian Islands important to the United States?
8. Where is Guam? Samoa? The Virgin Islands?
9. What is the importance of the Canal Zone?

PROBLEMS AND PROJECTS

1. What are the chief causes determining the location of cities in New England? Illustrate by naming one city in each case.
2. Boston is nearer Liverpool than is New York City. What prevents Boston from having as much foreign commerce as New York? On an outline map of the world, show the direction of a steamboat route from Boston to Liverpool. New York to Liverpool.

3. On an outline map of New England, locate and name a city prominent for the manufacture of each of the following products: shoes, silverware, firearms, clocks, brassware, machine tools, jewelry, hardware.
4. Why are cities like Providence, Fall River and Bridgeport smaller than New York, Philadelphia and Baltimore?
5. New England lacks coal and iron. Why does the manufacture of light metal wares predominate in this region?
6. What is the cause for the decline of wheat growing in New York State?
7. Study the transportation facilities of New Jersey. Make a list of each under the following headings: (a) good roads, (b) internal waterways, (c) harbors, (d) railroads.
8. From the tables of the United States Census or other sources, make a table listing the cities of the Middle Atlantic States having a population of (a) over 500,000, (b) 200,000 to 500,000, (c) 100,000 to 200,000. How many of each group are in New York State? Pennsylvania? New Jersey? Maryland? Delaware? What do you conclude as to the importance of large cities on the business of this region?
9. Why is New Jersey a great manufacturing state in spite of the fact that it has small fuel and water-power resources and produces very little of the raw material used in its factories?
10. On an outline map of the United States, trace the railroad route of a shipment of goods from your city to New Orleans.
11. Make a list of the cities in the southern states having a population of 25,000 or over. Compare this with a similar list of cities in New York State. Why the difference in the number on each list?
12. On a map of the state of Mississippi, locate all the villages and towns having a population of 3,000 or over. Account for the rural nature of this state. Where are the larger towns located? Why?

13. Make a table showing the cities in the central states having a population over 100,000. How many are situated on (a) the Great Lakes, (b) the Mississippi River system? How many are inland cities?
14. Why are so many cities in the central states noted for the manufacture of automobiles?
15. On a map of the United States show the location of (a) the corn belt, (b) the sugar-beet belt, (c) spring wheat region, (d) winter wheat region.
16. The silk worm and the mulberry tree upon which it feeds both do well in the state of Indiana. Why is it not a good place for the production of silk?
17. Find out the percentage of improved land in each state in the United States. Make a bar graph illustrating your findings. Which state has the greatest percentage of improved land? Why?
18. Duluth, Minnesota, is near the head of Lake Superior, holding a position somewhat like that of Chicago at the head of Lake Michigan. Why is Duluth of less commercial importance than Chicago?
19. On an outline map of the United States, place a figure in each state representing the population per square mile. What is the cause of the small population of the western states?
20. The meat supply of the United States is not increasing in proportion to the population. Give at least three reasons for this condition.
21. Write a report on irrigation in the West touching on (a) the location of arid regions, (b) reasons for lack of rainfall, (c) how irrigation is changing life conditions in the dry West, (d) important crops raised.
22. On an outline map trace the routes of the following railroads: Santa Fe, Southern Pacific, Northern Pacific, Union Pacific.
23. Why are little coal and lumber exported from Alaska to the United States?
24. Determine approximately the number of miles from New York City, via the Panama Canal, to each of the

following cities: San Francisco, Yokohama, Manila, Melbourne. Compare these distances with those via the Cape Horn route.

TOPICS

1. New agricultural crops which might be grown in Alaska.
2. The mineral wealth of Alaska.
3. Albany, New York, as a port for ocean-going vessels.
4. The development of hydro-electric power.
5. The manufacture of iron and steel.
6. Milk for Boston and New York City.
7. The growth of the cotton manufacturing industry in the South.
8. The economic value of the Great Lakes to the following industries: lumber, coal, iron, paint.
9. Wheat production: (a) regions of growth, (b) methods of harvesting, (c) marketing, (d) milling centers.
10. Motion picture industry of southern California.
11. Seattle, the port of the future.

FOR CLASS DISCUSSION

1. Quantity of manufacturing depends on nearness to coal.
2. The large sums spent on the Barge Canal in New York State are justified, although the canal is little used.
3. Diversified farming is the salvation of southern agriculture.
4. The South can never be the manufacturing region that New England is.
5. The destruction of the forests will vitally affect every industry in the central states.
6. Buffalo will become the most important commercial and industrial center east of the Mississippi River.
7. Los Angeles will eventually become a larger city than New York.
8. Alaska will one day be the most valuable possession of the United States.

CHAPTER XXIII

MISCELLANEOUS NORTH AMERICA

SECTION 1—CANADA

Area and Population. The great Dominion of Canada extends from about the latitude of the North Cape, in Norway, to Rome, Italy. It is about thirty times the area of the British Isles, and even exceeds that of the United States, Alaska, Hawaii, Porto Rico and the Virgin Isles combined. Its total area is 3,603,900 square miles.

The population of Canada was officially estimated in 1920 to be nearly nine million. The population, omitting the little explored Northwest Territory, is a little under three persons per square mile, in other words, just about one-tenth of the population per square mile of continental United States. This country consists of nine provinces and two territories, with population as follows:

	Estimated Population 1928
Alberta	607,599
British Columbia	542,582
Manitoba	639,056
New Brunswick	395,870
Nova Scotia	550,837
Ontario	3,264,150
Prince Edward Island	88,615
Quebec	2,561,817
Saskatchewan	820,738
Northwest Territory	12,184
Yukon	7,989
Total Population	9,491,437

Here, there is a vast unsettled country with resources enough to support at least fifty million or more persons. The character of the people and the climate of the country are such as to make Canada the one serious rival of the

United States in this hemisphere. At the last census, the percentage of Canadian born population was 64.49, British born 17.82, and foreign born 17.69.

The foreign population is largely in the prairie provinces, and, to a considerable extent, is composed of immigrants from the United States who have been attracted to these provinces because of their cheap and highly productive lands.

Natural Resources. Canada is rich in natural resources, the chief of which are agriculture, forests, mines, and fisheries. The long hours of sunshine, which last from sixteen to nineteen hours daily in the summertime, and the warm Chinook winds in western Canada push the limits of grain growing and forests over a thousand miles north into Canada. The broad plains in western Canada are more favorable to agriculture than the plains just to the south in the United States. This is due, primarily, to the fact that rains reach the Canadian plains in greater amount than in this country, and also that evaporation is much less.

Agriculture. Agriculture is now the leading industry in this country, and wheat is the chief money crop of Canadian farms. Agricultural products represent the largest share of Canadian exports. Oats, hay, potatoes, apples, and barley are also important crops in this section. The greatest wealth, however, comes from the wheat crop, which in 1927 amounted to over 440,000,000 bushels. Canada ranks second in the list of wheat-producing countries of the world. Most of this crop is grown on the great plains in the west where climate and soil are so splendidly adapted to this crop.

In the St. Lawrence valley, which has a shorter growing season owing to the colder winters, the principal crops are hay, oats and potatoes. In southern Ontario, we find much of the climate and soil of Michigan duplicated. Here is the principal apple and small-fruit growing region.

From southern Ontario also comes most of the dairy products of Canada, and this is a factor in making Canada the greatest cheese making and cheese exporting country in the world. The output of cheese in 1927 amounted to

138,000,000 pounds. In 1927 the provinces of Ontario and Quebec manufactured over 178,000,000 pounds of butter. The total value of dairy products of the entire country amounted to over $250,000,000.

(Courtesy Canadian National Railways)

FIG. 184. GRAIN HARVESTING, WESTERN CANADA

Mineral Resources. Like the United States, Canada has a large variety, as well as a large extent, of minerals. Throughout the length and breadth of the country, minerals in paying quantities exist. Very little is known of the possibilities from a mineral standpoint of the practically unexplored Northwest Territory. It is calculated that deposits of gold, copper, and nickel exist here in considerable quantities, and perhaps here is one of the largest areas of oil-bearing country yet unexplored. Already oil fields have been found and the country gives every promise of having a much larger supply.

Gold, copper and iron are known to exist in paying quantities in three regions. Gold is found in the Yukon territory; copper, in the mountain region of British Columbia; and iron, in the Lake Superior region and Nova Scotia. Canada has virtually a monopoly in the production of nickel, the mines around Sudbury being the most productive in the world.

Canada also has large deposits of mica and furnishes the market of the United States with practically the entire amount that is consumed here. Canada also produces between eighty and eighty-five per cent of the world's entire supply of asbestos. The principal mines of this mineral are located in the province of Quebec.

Canada also has large fields of coal, but their location is such that the best advantage and use cannot be made of them. The great, populous St. Lawrence Valley is almost devoid of coal, and has to import much of this mineral from the United States. The coal mines of Canada are known to extend over an area of more than 111,000 square miles. These may be conveniently divided into the bituminous coal fields of Nova Scotia and New Brunswick, the lignite fields around Manitoba and Saskatchewan, and the anthracite and bituminous fields in British Columbia, Vancouver Island and Queen Charlotte Islands.

The lack of natural waterways and railroads will hinder the full development of this western field for some time to come. The cost of transportation, by rail, of coal for the eastern provinces is prohibitive and accounts for the fact that Canada has been importing over 20,000,000 tons of coal yearly from the United States for the last three years.

Lumber. The greatest asset of Canada is perhaps its forests. The total area covered by forests is estimated to be between 500 million and 600 million acres; one-half of this area is covered with timber suitable for sawing into lumber. A large part of the remaining acreage is covered with timber suitable for use as paper pulp.

From the standpoint of lumber resources Canada ranks third in the world. The principal varieties are spruce, cedar, Douglas fir, white pine; also hardwoods such as oak, ash, hickory, and several varieties of the maple. There is also an abundance of hemlock, the bark of which gives rise to the tanning industry which is especially prominent at Quebec.

Fisheries. Canada also possesses some of the most extensive fishing waters in the world. Nearly four-fifths of the fishing waters of the north Atlantic region belong to Canada. There are also the great Hudson Bay and the Pacific Coast.

As in the case of the fishing industry in the United States, the principal varieties of fish are cod, haddock, and halibut on the Atlantic coast, and salmon on the Pacific coast.

Fur. Fur bearing animals abound in considerable numbers in the vast sub-arctic forests of Canada, and fur trading has been an important part of Canadian activities since the earliest days of the French regime, when that trade was monopolized by large proprietary companies. In this section, are found furs of great value, including the beaver, sable, marten, and black and silver fox.

(Photograph by Ewing Galloway, N. Y.)

FIG. 185. SILVER BLACK FOXES

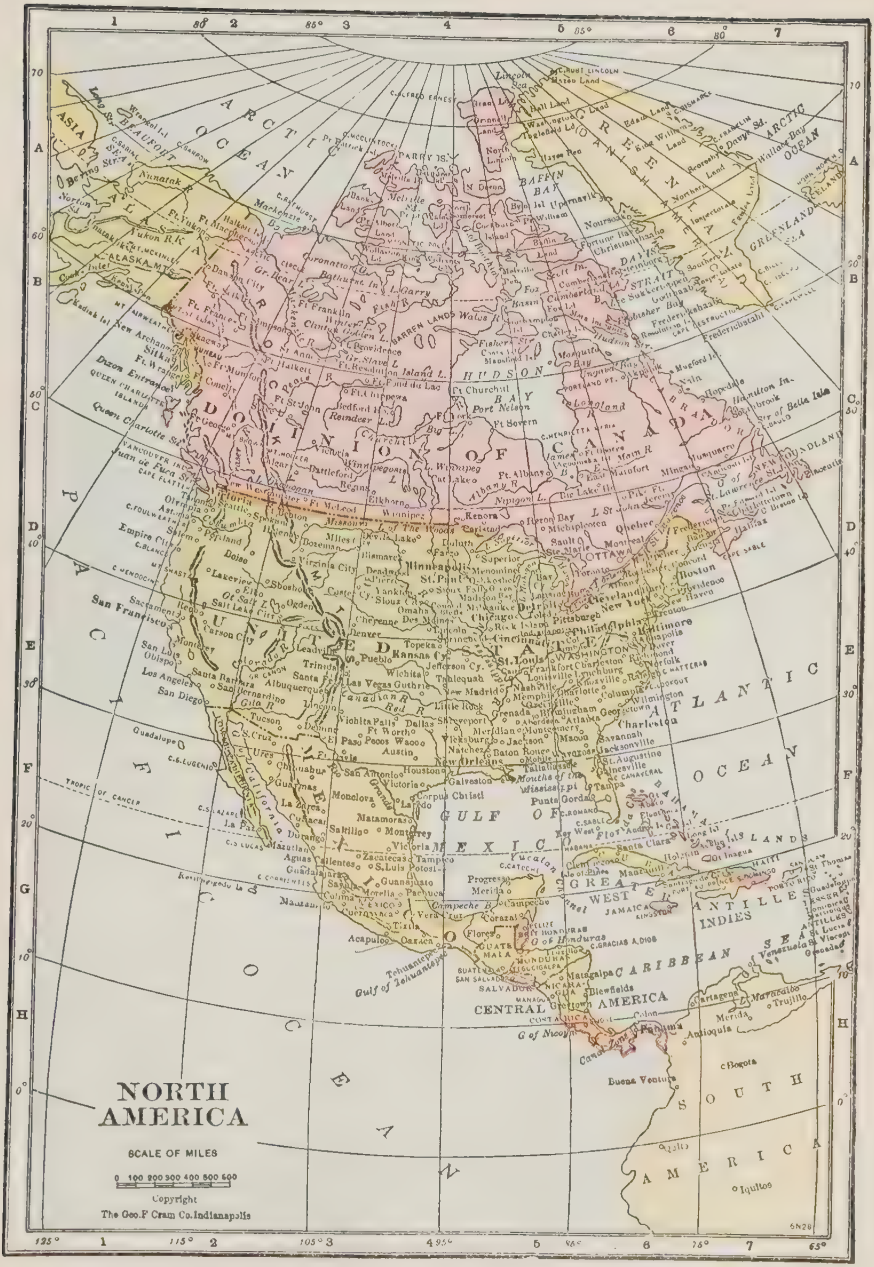
An important fact to note in connection with the fur trade is that Canada no longer depends for its supply of skins upon the trapping of wild animals, but is now raising various fur-bearing animals on farms. Large farms are now given over in Canada to the fox, Persian lamb, raccoon, mink, marten and skunk. The leading section in fur farming is found in the province of Prince Edward Isle. The export value of furs from Canada in the year 1926-1927 amounted to over $18,800,000.

Manufactures. The industrial development of this country is very small when compared to the resources that are capable of development. This is undoubtedly due to the fact that Canada is relatively a new country. Immigration from Europe has gone through the ports of the southern Atlantic seaboard, while Canada has been out of the line of march. Three important factors have hindered manufacturing in this region: the lack of a supply of labor; lack of adequate transportation facilities; and a small market for its product. In the matter of wealth of raw material and power, Canada is equalled only by the United States.

Canada, however, has made great strides in manufacturing development in the last thirty years. There is a distinct movement among the people of Canada to so build up the industries of that country that all wants, along the lines of manufactured products, can be supplied at home.

Some of the industries have a distinct advantage due to the cheapness of the raw materials, and hence we find that lumbering, grain, and dairy industries are developed to a high degree. Also, the pulp mills in the east have the advantage of location near the supply of spruce. The iron and steel industry is carried on in Nova Scotia in a small degree. The city of Sydney is the principal center, being located near supplies of coal, iron and limestone. There are also important steel works along the coast of the Great Lakes, especially at Toronto, Hamilton and Sault Ste. Marie.

Transportation Facilities. No country has more magnificent waterways than Canada. Here we find great rivers, the Yukon, Mackenzie, Saskatchewan, and St. Lawrence. All of these rivers reach far into the interior and should be natural routes of trade. With the exception of the St. Lawrence, none of them are of much commercial importance. All of the rivers are ice bound a considerable portion of the year, which prevents the full utilization of these streams. The fact that the St. Lawrence is icebound a portion of the year causes much of the trade to turn from its natural channel and seek an ocean port that is ice free, such as New York City.


NORTH AMERICA
SCALE OF MILES
0 100 200 300 400 500 600
Copyright
The Geo. F Cram Co. Indianapolis
ARCTIC OCEAN
ARCTIC OCEAN
GREENLAND
BAFFIN BAY
DAVIS STRAIT
HUDSON BAY
DOMINION OF CANADA
ALASKA
UNITED STATES
MEXICO
CENTRAL AMERICA
GULF OF MEXICO
ATLANTIC OCEAN
PACIFIC OCEAN
CARIBBEAN SEA
GREAT ANTILLES
WEST INDIES
BAHAMA ISLANDS
SOUTH AMERICA
ASIA
Bering Str.
BEAUFORT SEA
TROPIC OF CANCER
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Ottawa
New York
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San Francisco
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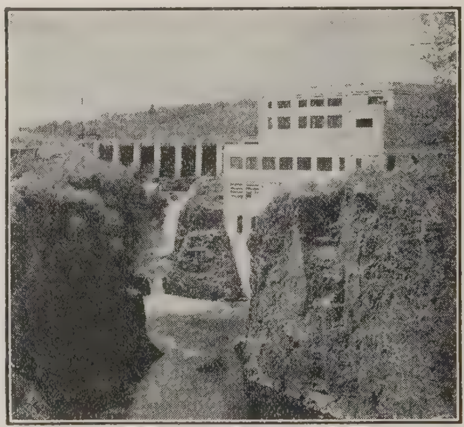
FIG. 186

In the matter of railways, Canada has a greater mileage in proportion to population than any other country. According to figures of December, 1927, the total mileage of Canadian railways was 54,717 miles, or over fifty miles of railroad to every ten thousand inhabitants. Three transcontinental roads connect the Atlantic and Pacific, namely, the Canadian Pacific, Grand Trunk and the Canadian Northern.

Cities. The commercial capital of Canada is Montreal. Although this city is a thousand miles inland it is virtually a seaport. Geographically, it has a better location than New York, for it is nearly three hundred miles nearer Liverpool than New York and is also on the natural outlet for the Great Lakes basin of the United States and Canada. Ice is the factor that prevents it from seriously competing with New York and becoming the metropolis of the new world.



(Courtesy Canadian National Railways)

FIG. 187. POWER DEVELOPMENT, GRAND FALLS ON ST. JOHN RIVER, NEW BRUNSWICK

Quebec was formerly the most important city. It is the oldest city in Canada and has become prominent as a manufacturing rather than a commercial center. The building of a railroad bridge at Quebec has helped this city considerably in connecting it up with the Atlantic ports of the provinces.

Two other cities of importance should be mentioned, namely, Halifax and St. Johns. Both of these cities are located on ice free harbors and are railroad terminals for trunk lines to the west.

The second city in size in Canada is the city of Toronto. This city is located in the midst of a rich hinterland in the Ontario peninsula.

Going farther west we come to the city of Winnipeg on the prairies north of the Great Lakes region. This city has become a railway center for the transcontinental roads of Canada and is located in the midst of the world's richest grain fields. No other city in the world has so large an undisputed hinterland as Winnipeg. Were it not for the international boundary line this city would be a serious rival of Minneapolis and St. Paul.

Edmonton, a town a thousand miles north of the southern boundary, is important principally as a fur depot and as the center for outfitting hunters, trappers, and miners.

In General. Commercially, the Dominion of Canada is the best customer of the United States. Over sixty-two per cent of its imports come from the United States. We need Canadian goods and Canada needs ours. When the time comes that this nation becomes an importer of wheat and other raw materials, which may not be far off, it is then that we shall have to look to Canada as the great supplier of wheat and other materials.

Geographically, the Dominion of Canada is an extension of the United States, and the fact that people of the same language and race are on both sides of the boundary line does much to make each country the complement of the other.

TEXT QUESTIONS

1. Name the nine provinces of Canada.
2. Of what do the natural resources of Canada consist?
3. How does Canada rank as a wheat producing country?
4. What minerals does Canada produce in abundance?
5. Name three transcontinental railroads in Canada.
6. What province leads in fur farming? What advantages does this province have for that industry?
7. Why has Canada been slower than the United States in developing manufactures?
8. Locate the following cities: Edmonton, Halifax, Toronto, Winnipeg, Vancouver.

SECTION 2—LATIN NORTH AMERICA

In General. In this division should be included Mexico as well as the small states comprising the regular section called Central America on all political maps, for geographically and climatically they are the same. In both sections, the coast is low and unhealthful, while toward the interior the land rises to a high plateau, making it more habitable for man. These countries are rich in natural resources.

One of the greatest oil districts in the world is in the district around Tampico on the gulf of Mexico. This country has some of the richest silver mines in the world. Other minerals occurring in large quantities are zinc, lead, and copper. Mexico ranks among the leaders in the production of copper. Gold and silver are found in paying quantities in several of the small states in Central America, particularly Nicaragua and Honduras. There is also iron in abundance in Mexico.

Most of the natural resources of this region are poorly developed on account of poor transportation facilities as well as on account of the backwardness of the people. Here we find a strange mixture of white, Indian, and negro, with the Indian in predominance. In the state of Mexico, the Indian represents about 40 per cent of the entire population, which goes far towards explaining the unstable political conditions in that country.

Natural Resources. One of the vast untouched resources of this region is its wealth of forest materials. Here, along the Caribbean Sea, are dense forests producing mahogany, rosewood, cedar, logwood, and rubber. The cultivated products of this region are of every variety from tropical to temperate, according to the elevation cultivated. The most distinctive crop is coffee which is grown from southern Mexico into Central America on the Pacific slope. Tobacco and cotton are of some importance, especially in Mexico.

Manufacturing. The manufacturing of this entire region is largely of the handwork type. The economic development of the race shows its influence to a marked degree. As in the Orient, we find here the making of hand carved and inlaid woods, pottery, jewelry, and leather articles. Another factor that has hindered the factory type of manufacturing is the lack of fuel.

(Keystone View Company, Inc., N. Y.)

FIG. 188. VIEW OVER LACATECAS, MEXICO

While this region is rich in precious metals, iron, and oil, it is lacking in coal. There are, however, a few blast furnaces in the vicinity of Monterey, which is located near coal fields of some value.

Cities. The principal commercial centers of this region are located along the eastern coast. Vera Cruz is the principal commercial port of this section, it being the natural outlet for most of the plateau region of Mexico. The fact that it is connected with the interior by rail has helped this city to keep a primary place as a commercial center. Tampico, a little further north, however, has a better harbor and an easier entrance to the plateau.

On the western shore of Mexico is the harbor of Acapulco, the first harbor on the Pacific coast of any importance south of San Francisco. Here are good shipping facilities and a good harbor. The only thing lacking is better connections with the interior. The mountain ranges come close to the coast, forming a difficult barrier to overcome. This harbor has an important location in that it is in a direct line with the shortest route from the Panama Canal to the Hawaiian Islands and the Orient.

Commercial Positions. This entire region, so rich in precious metals, tropical fruits, forest products, and cattle, is comparatively poor. Reasons are that, owing to the scarcity of water, much of the interior is given over to stockraising, an occupation affording few comforts; also, that much of the land is held by a few wealthy men, forming an aristocratic class, while the common people, who work on these lands, are little more than slaves. The lack of railroads and navigable rivers from the interior, together with the lack of a stable government, has done much to retard the full commercial development of this region.

THE WEST INDIES

In General. Stretching from the southern tip of Florida, and forming a curve east and south to continental South America, are two groups of islands called the West Indies. The larger islands, Cuba, Porto Rico, Jamaica, and Haiti, are called the Greater Antilles, while the many smaller islands to the east and south are known as the Lesser Antilles.

Cuba. The largest island of this group is Cuba. The surface of the island is fairly level, though a low range of hills runs through the center.

The business of this country is largely agricultural and is mostly centered around two crops, sugar-cane and tobacco. Nearly one-half the cultivated land in Cuba is planted with sugar-cane. Cuban sugar-cane growers have been able to compete with the beet-sugar growers of the temperate regions, because of their ability to produce so cheaply. The climate and soil of this region are so well adapted to sugar-cane that annual planting is not necessary. Besides sugar and tobacco, Cuba raises bananas, cocoanuts, lemons, and pineapples.

Cuba also has a wealth of forest products, especially mahogany, Spanish cedar, and dye woods. The cedar is used in the manufacture of cigar boxes. The forests are in the eastern end of the island around Santiago.

The manufactures of Cuba are of a simple type and consist of sugar, tobacco, and plaited straw hats.

Haiti. Two republics make up the island of Haiti. The western end is called Haiti and the eastern end, San Domingo. Both republics are made up of French and Spanish speaking negroes.

(Keystone View Company, Inc., N. Y.)

FIG. 189. MARKET DAY, KINGSTON, JAMAICA

From the point of view of commerce, this island is of importance mainly on account of its forest lands which contain cabinet and dye woods, and ebony. Its agricultural products consist of sugar, tobacco, some cotton, and bananas.

Jamaica. The island of Jamaica belongs to the British Empire. Here are produced the characteristic crops of the tropics, including coffee, bananas, sugar and cocoanuts. Most of the trade of Jamaica is now with the United States.

Lesser Antilles. The hundreds of smaller islands on the eastern border of the Caribbean Sea are owned by various nations such as Great Britain, France and Holland. Most of these islands raise some cotton, sugar-cane, and tobacco. The island of Trinidad is the most important commercially. Here is the remarkable asphalt lake. This is a pitch lake, the top of which forms a crust due to exposure to the air. The crust can be cut into large pieces and shipped to the various parts of the world to be used for paving.

TEXT QUESTIONS

1. What are the principal commodities of commerce in Mexico?
2. In what does the principal importance of the Central American states consist?
3. What is the nature of the soil and climate of Mexico?
4. What islands are included among the Greater Antilles?
5. Describe the topography of Cuba.
6. Of what commercial importance is the island of Haiti?

PROBLEMS AND PROJECTS

1. In what way would free trade with Canada be (a) beneficial to the United States, (b) a detriment to the United States?
2. Why are the cities on the northern shores of the Great Lakes much smaller than those on the southern shores?
3. Compare Montreal with New York City as to (a) nearness to Europe, (b) harbor, (c) hinterland, (d) transportation facilities, (e) foreign commerce.
4. Why are the provinces of New Brunswick and Nova Scotia agricultural, while the New England states are industrial?
5. What conditions have increased the production of wheat in Canada? By what routes does Canadian wheat reach the Atlantic seaboard?
6. Account for the difference in the development and prosperity of Cuba and Haiti.
7. Why is Mexico less developed commercially and industrially than Canada or the United States?

8. Why is the bulk of trade in Jamaica with the United States rather than Great Britain?

TOPICS

1. The importance of fur farming in Prince Edward Island.
2. The hinterland of Winnipeg.
3. The dairy industry in Canada.
4. The need of tariff reciprocity between United States and Canada.
5. Governments in Latin North America.
6. Need of better trade relations between the United States and Latin North America.
7. The advisability of United States interference in Haitian affairs.
8. Banana growing in Costa Rica.
9. Advantages of Nicaragua for a route for an inter-ocean canal.

FOR CLASS DISCUSSION

1. There should be a close industrial and commercial union between Canada and the United States.
2. The St. Lawrence River Canal will boom agricultural and commercial interests in the United States.
3. Mexico's problem is a racial problem.
4. The islands of the West Indies are too unhealthful for the white race.
5. The states of Central America should form into a single state or federation of states.

CHAPTER XXIV

SOUTH AMERICA

SECTION 1

In General. From the economic point of view, the development of South America is very slow. Next to Africa, it is the most backward continent in the world. With the exception of the coast regions, it is sparsely inhabited. Here we find a continent with a large extent of navigable streams, an abundance of fertile land, and mountains containing a vast wealth in minerals, that still remains in an almost natural condition, despite the fact that the white man discovered and settled here many years in advance of North America.

Causes for Backward Condition. 1. About three-fourths of the land in South America lies in the tropical zone. This zone is also the region of a very heavy rainfall, causing heavy jungle growth, and, therefore, is not well suited to emigrants from temperate lands. The hot climate of this region takes away the energy and vitality of the white race, so that business cannot develop as it does in the more temperate regions of the world.

2. The continent of South America has no deep indentations on its coast line. There are but one or two good natural harbors on the whole continent. This lack of harbors makes accessibility to the interior very difficult.

3. Practically all of South America is east of the eastern coast of North America and far removed from the highly developed regions in North America and Europe. It also faces Africa, the most backward continent in the world.

4. The extreme elevation of western South America and the luxuriant growth of tropical vegetation make the cost of building roads prohibitive.

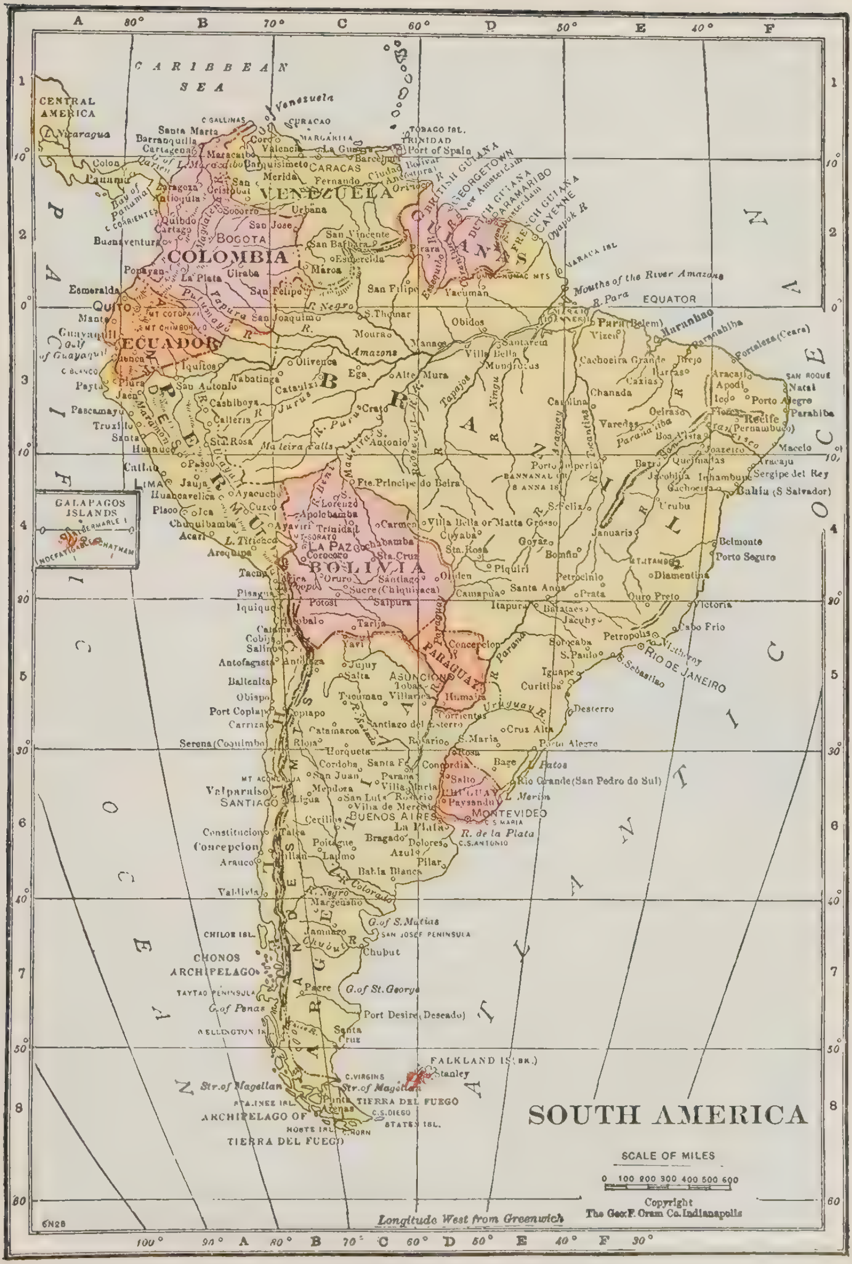

SOUTH AMERICA
CARIBBEAN SEA
PACIFIC OCEAN
ATLANTIC OCEAN
EQUATOR
CENTRAL AMERICA
COLOMBIA
VENEZUELA
GUIANAS
BRITISH GUIANA
DUTCH GUIANA
FRENCH GUIANA
ECUADOR
PERU
BRAZIL
BOLIVIA
PARAGUAY
URUGUAY
ARGENTINA
CHILE
PATAGONIA
ANDES MTS
GALAPAGOS ISLANDS
FALKLAND IS. (BR.)
TIERRA DEL FUEGO
ARCHIPELAGO OF TIERRA DEL FUEGO
CHONOS ARCHIPELAGO
Mouths of the River Amazons
Amazons
RIO DE JANEIRO
BUENOS AIRES
MONTEVIDEO
SANTIAGO
LIMA
QUITO
BOGOTA
CARACAS
LA PAZ
ASUNCION
Str. of Magellan
C. HORN
R. de la Plata
SCALE OF MILES
0 100 200 300 400 500 600
Longitude West from Greenwich
Copyright
The Geo. F. Cram Co. Indianapolis
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FIG. 190

5. South America has a large number of inhabitants whose wants are so simple that there is no market for modern conveniences and manufactured products. Here is a continent, with the exception of the basin of the Parana and Plata Rivers and the valleys of Chile, the inhabitants of which are made up of a mixture of Indian, negro and white. Probably not more than 25 per cent of the population of tropical South America is pure white, and many of the descendants of the early Spanish and Portuguese settlers in this region lack the energy of their forefathers, due to the enervating effect of the climate.

Natural Regions. Most of the wealth of South America is derived from its mountains and plains. This continent is still in the extractive stage of commerce in that most of its trade and commerce has to do with agriculture, mining, and the products of the forests.

From a commercial standpoint, the plains of South America are among the richest in the world. The great plains in this continent extend north and south over a distance of four thousand miles through the interior. These plains are divided into three sections, called the plains of the Orinoco, plains of the Amazon, and plains of the La Plata.

The plains of the Orinoco are, for the most part, in the country of Venezuela. The climate here is very warm. The heat and long periods of drought prevent the grasslands of this plain from being ideal for cattle raising.

A little further to the south, the plains of the Amazon are found. These plains are covered with an abundance of vegetation and occupy about half the area of Brazil, as well as portions of Colombia, Ecuador, Peru, and Bolivia. The great wealth of this plain is in its forest products and is only very slightly developed for want of transportation facilities. No other part of the world offers so large a variety of valuable woods. Here is found the famous Para rubber tree, which formerly gave a great deal of wealth to the country of Brazil. The high temperature and heavy rainfall of the region along the Amazon River are specially adapted to the growth of this tree.

According to the variety of vegetation the plains of the Amazon may be divided into belts, each belt showing a different variety of products. The palm tree belt occupies a region lying along both sides of the Amazon for almost its entire distance. Here we find the rubber and ebony trees, as well as a variety of tropical fruits, such as bananas, dates, and cocoanuts from the higher slopes to the west.

Another belt is known as the region of virgin forests, and has an immense wealth of gums, rosins, and medicinal plants as well as cabinet and dyewoods. This region extends south from the mouth of the Amazon to Bahia in Brazil. Farther south, in the uplands of this valley, is the coffee, tobacco and sugar belt. Here is grown about four-fifths of the coffee that is consumed in the world. Coffee is Brazil's most important and valuable export. In this same region, cotton is another crop that is also grown to some extent.

(Photograph by Ewing Galloway, N. Y.)

FIG. 191. TRAVELING HIGH ABOVE THE SNOW LINE NEAR CHRIST OF ANDES STATUE, ARGENTINA

The plains of the Parana, or the Plata, are noted for the hardwoods of the northern section, and the great wheat and pasture land of the southern section. Along this river, in Paraguay, grows the hardest wood known, namely the lapacho, nandubay and quebracho. These hardwoods rival teakwood in durability. It is, however, in the southern section of these plains that there has been the greatest development.

Live stock raising and agriculture have been developed to such an extent that Argentina is today one of the great grain growing and meat producing countries in the world.

East of the 64th meridian of longitude, we find a climate somewhat like that in our western states west of the 100th meridian. This section is of great importance as a future supplier of wheat. Only a small portion of the lands is under cultivation, and despite this fact, over five per cent of the world's supply of wheat and corn comes from this region.

Live stock raising is also an important activity in this region. The great fertile pasture lands furnish an abundant supply of food. According to the latest figures, Argentina has thirty million head of cattle and sixty-seven million head of sheep.

Along the entire western section of the continent, the Andes Mountains extend their lofty peaks and high plateaus. Here is a region which, in the torrid zone, has every phase of climate from frigid through temperate to tropical. On the warm and calm coasts of Ecuador grows the famous cacao tree which produces the cocoa of commerce. Another important product from the Andean valleys of this region is cinchona bark, from which quinine is made. The northern section is a region of minerals, rubies, and emeralds; the silver mines in Peru and Bolivia have been worked for centuries and still have vast supplies of materials.

Farther south in Chile, we come to the famous nitrate producing section which is so important in the commerce and trade of Chile. Over 85 per cent of the exports of Chile consists of nitrate products. Here, also, is the principal copper producing section of South America. Coal mines and fields are to be found in the section of Coronel, which is the chief coal port on this continent.

Manufacturing. In the torrid zone, the principal type of manufacture is that of articles made by hand. Thus we find in this region considerable work in pottery and leather. In Ecuador is the chief center for the making of the famous Panama hats, so called largely because of the fact that these hats are shipped abroad through the Panama Canal region. There are also some cotton mills in Brazil and Peru, especially wherever there is an abundance of water power to be had.

In the temperate region, manufacturing has made a little more progress. For example, the country of Uruguay has a large trade in beef extract, while the making of flour, the refining of sugar, and the tanning of leather are activities largely carried on in Brazil and Argentina. Chile ranks high as an industrial country. This country has large steel works and smelteries of copper. Another industry of high rank in this country is the production of iodine.

(Photograph by Ewing Galloway, N. Y.)

FIG. 192. IGUASSÚ FALLS, ARGENTINA

Cities. The most important city in South America is Buenos Aires in the Argentine Republic. This city is the natural outlet of almost the entire continent, and with the completion of railways connecting it with Santiago in Chile and the Bolivian plateau, this city will no doubt become the leading commercial city of this continent, as New York City is of the northern continent.

Buenos Aires has the advantage of being located in the temperate zone and in the midst of a rich fertile land. The temperature is such that the people from Europe and other temperate regions seeking a home, more quickly adapt themselves to this locality.

Rosario, a city of some two hundred thousand people, located on the Parana river, is in the center of the wheat growing section and, because of its accessibility to ocean vessels, has become the port for the exportation of wheat in this region. Tucuman, in the center of Argentina, is in the sugar producing region, and its industries are largely given over to the refining of that product.

Mendoza, located in the western part of Argentina, is in the center of fruit growing and wine making. Because of its climate and products, this region is often called the California of the Argentine.

On the Pacific coast most of the commerce of Chile passes through the ports of Iquique, Antofagasta, and Valparaiso. None of these cities has a good harbor. Iquique is the chief nitrate port. Here is a city that has grown up in a most forbidding place as the result of the great deposits of nitrate in the Atacama Desert. Antofagasta is the chief port of the Bolivian plateau for goods sent towards the Pacific. Valparaiso is important as the port of Santiago and the terminus of an east and west railroad connecting the Atlantic and Pacific Oceans.

In the tropical zone, a few cities may be mentioned as being of commercial importance. Rio de Janeiro, a city of a million inhabitants in Brazil, is the chief port of tropical South America. It has an excellent harbor and is an important coffee exporting port.

Other cities that are important are as follows: Santos, in Brazil, the center of the coffee growing section; Para and Manaos, on the Amazon, chiefly important as rubber ports; Potosi, in Bolivia, remarkable for its silver mines; Guayaquil, important only as being the port for Quito. The chief cities in the north are Bogota, the capital of Colombia, Barranquilla, the outlet for the Magdalena River valley, and Caracas, the capital of Venezuela.

Foreign Commerce. The bulk of imports to these countries in South America consists of manufactured products. As a result, these nations buy largely from Europe. This is due, in part, to the fact that South America is near the ports of Europe and also that the people of this country favor Europe as a place to buy finished products.

The three great commercial nations of this continent are

Argentina, Chile and Brazil. According to figures last obtainable, the average annual exports of Argentina in animal and meat products amounted to over $161,000,000; the exports of Brazil show an annual shipment of coffee amounting to over $180,000,000. The chief export of Chile is that of mineral products, which amount to over $109,000,000 a year.

From the standpoint of balance of trade, the United States has suffered a great deal in its dealings with South American countries. This country has failed to make the headway that the merchants and traders of England, France, Germany, and Italy have. This has, in a large measure, been due to the faults of American business methods. Some of these faults may be summarized as follows: faulty packing of goods, unwillingness to extend long time credits, failure to meet the needs of the South American consumer, and unwillingness to study the language of the people.

Trade Routes and Transportation. As stated elsewhere, a serious drawback in the commercial and economic development of South America has been its lack of transportation facilities. The continent has many large rivers, but the lands about most of them are so impenetrable that no habitation is found any distance from the river banks. As a result, the ports along these rivers are usually small and concerned solely with the raw materials to be found close at hand. While the Amazon and the Parana River systems can be likened to the St. Lawrence and Mississippi River systems of North America, yet the former valleys are in no sense settled except for the region near the mouth of the La Plata River.

Vast territories in central and western Brazil are without human habitation of any sort, either savage or civilized. The water sheds between the Orinoco, Amazon, and Parana systems are very low, and during the period of heavy rains, the waters of each system mingle together. A dream of many South American engineers is a continuous waterway from north to south by means of digging canals to join the waters of each system. This would make a short route from

Panama and the ports of North America to Buenos Aires. Because of the vast wilderness and lack of cities along the route, however, such a waterway would probably be too expensive to build and maintain.

Railroads. In the matter of railroad building, there has been considerable development in the republics of Argentina, Chile, Uruguay, and Brazil. There is one inter-oceanic railroad from Buenos Aires to Valparaiso. Another is proposed from Bahia Blanca to Zapala, at the foot of the Andes, to be extended to the Pacific at Valdivia. A line connects Montevideo and Rio de Janeiro, which will be extended up the coast to Bahia and Pernambuco, where it will connect with Atlantic steamers from Europe and the United States, thus shortening the time from these ports to the ports on the La Plata River.

A new line has been recently completed across Brazil, from Corumba, a port on the Paraguay, eastward to Rio de Janeiro. Chile has a railroad running from Tacña and Iquique south to Porto Montt. This road is intersected by a number of short lines running east and west and touching the coast at various points. The topography of the country in northern Argentina lends itself readily to the building of roads; hence, we find a network of roads in this section more dense than in any other country in South America. In addition to the continental road mentioned, there are routes tapping the Bolivian plateau, besides a number of short lines running between Bahia Blanca, in Argentina, and Buenos Aires.

Railroad Building. Railroad building in Peru, Ecuador, and Colombia is an expensive operation. We find here only a few short routes. The same is true of the northern republics, as the topography and climate of these regions make the building of long railways unprofitable. Most of these lines run for only a short distance, affording an outlet to some port nearby. The highest railroad in the world is in Peru at an approximate elevation of 16,000 feet above sea level. This road is only profitable because it can handle the ores from the Cerro de Pasco mines.

Another interesting road is the line from Quito to Guayaquil. This road, less than 300 miles in length, is located in a region which is rich in tropical fruits and cacao. It will probably do a great deal toward stimulating the commerce of the city of Quito which, though located on the equator, is a thriving city with a temperate climate.

TEXT QUESTIONS

1. Name and describe the natural regions of South America.
2. What are the causes for the commercial and industrial backwardness of South America?
3. What are the characteristic manufactures of South America?
4. Name and locate the three great river systems of South America.
5. Where is nitrate found? Of what use is it?
6. What rivers are included in the La Plata group?
7. In what does the wealth of the Amazon forest consist?
8. Name five commodities produced in South America that are not produced at all in the United States.
9. Why are there so few railroads in South America?

SECTION 2

COLOMBIA

In General. This republic, which has an area about the same as the thirteen original colonies of our own country, has a geographical advantage which no other country in South America has. It faces two seas, the Pacific and the Caribbean. The unfavorable coast line, however, nullifies to a great extent this apparent advantage. Its population is largely Indian and negro, not more than ten per cent being pure white.

Minerals. Colombia is the chief source of the world's supply of emeralds. These are found in the large veins of limestone in the general region of Bogota. Other minerals of importance are gold and especially platinum, found in the southwestern region of the republic. There are some deposits of coal and iron which enable the use of some small blast furnaces. The coal, however, is of poor quality. Very little is really known of the extent of the coal and iron resources of Colombia. The intense heat of this tropical region, together with the heavy growth in the jungles, greatly hinders the full development of mining on any extensive scale.

Agriculture. As in most tropical countries, farming is of a primitive type and is almost entirely on the uplands. The chief agricultural commodity of Colombia is coffee, which is important also to Brazil. This crop is excellently adapted to a country like Colombia, as it is non-perishable and requires very little labor and few tools. Other important agricultural products are bananas, sugar-cane and tobacco.

Forest Products. Colombia also has a great wealth of valuable forest products. As is the case with mining, the extreme heat and malaria of this region make it difficult to carry on lumbering to any extent. The principal varieties of trees are cinchona, from which quinine is obtained, dyewoods, and nut trees. Chicle, used in the making of chewing gum, also grows here in abundance.

Transportation. The transportation facilities of this country are very meager. The main artery of commerce is the Magdalena River, which runs north through the center of the republic into the Caribbean Sea. This river is navigable for small types of boats, but the unsatisfactory condition of its mouth prevents its full utilization. In the matter of railroads, Colombia is very poor. There are less than 1,000 miles of railways in the entire country, and many have different gauges.

Manufactures and Commerce. The manufacturing and commerce of this region are largely in a primitive state. The small proportion of highly developed inhabitants affords no real economic reason for trade and commerce. There is not the incentive in these tropical countries for manufacturing that is found in the more temperate regions. The manufacturing of this region consists of sugar refining at Cartagena, textiles at Barranquilla, flour milling and blast furnaces at Bogota. Between 70 and 80 per cent of the foreign commerce of Colombia consists of exports of coffee.

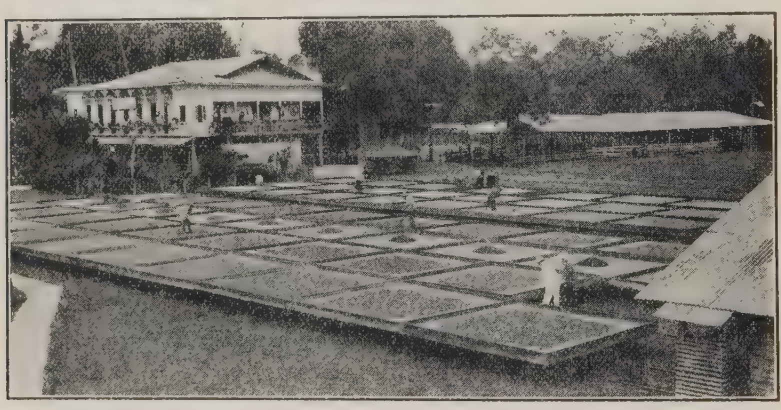
ECUADOR

In General. Ecuador is a small and a very poor country from a commercial viewpoint. There are almost no mineral resources. The principal product, as far as exports are concerned, is cacao. The climatic conditions of Ecuador are splendidly adapted to the growth of this tree, situated as it is in the belt of calms between the trade winds. This little country is also famous for one manufactured article. Practically all the Panama hats come from this region.

VENEZUELA

In General. The location of this country is most excellent for commerce with the United States and the West Indies.

The bulk of its population is in the northern part where the cool trade winds make living more endurable in this tropical region. In the southern section are the great llanos or grass plains. These great plains are potential cattle regions and considerable cattle raising is carried on there. But the long droughts of this region are making it too expensive for cattle raisers to compete with the more favored regions in the Argentine.



(Photograph by Ewing Galloway, N. Y.)

FIG. 193. DRYING COCOA BEANS, ECUADOR
The trays are pushed inside the sheds at night.

Minerals. Two minerals of great importance are found in Venezuela. The Bermudez pitch lake in the northeast, not far from the island of Trinidad, is the source of quantities of asphalt. Near the region of Lake Maracaibo is found a rich, oil producing region.

Agriculture. The principal crop of Venezuela is coffee. Cacao is second in importance. Cattle raising has declined considerably during the last twenty-five years. Climatic conditions are at the bottom of this decline, for during the wet season the plains and lowlands are flooded, and during the dry season the grass becomes too coarse and the cattle must be driven long distances to pasture. This condition coupled with the heat, animal pests, and cattle diseases does not make cattle raising an inviting field for profit.

Manufacturing and Commerce. Manufacturing is on a very small scale in this country. Some cotton manufacturing is carried on. Tobacco factories of considerable size are found in larger towns, such as Caracas and Maracaibo.

THE GUIANAS

In General. This region is not very favorable for commerce or trade. The climate is very hot and not at all suitable as a habitation for the white man. Most of the region is covered with forests and a very small percentage of the land is suitable for cultivation. The principal products of British Guiana are sugar and rice. In mineral resorces, there are gold and diamonds. In 1923 this country was second only to South Africa as a producer of diamonds.

In Dutch Guiana, sugar, cacao and coffee are the chief products. French Guiana is, in its natural products, about the same as the other two colonies.

PERU AND BOLIVIA

In General. These two countries have a very high elevation and, in the plateau regions, are very cold and dry. Agriculture has to depend largely on irrigation and is confined to sugar, cotton, and rice. The low standard of living of most of the inhabitants makes production very small.

Minerals. It is in minerals that these two countries are richest. Peru ranks high as a producer of silver and copper, while about one-quarter of the world's supply of tin comes from Bolivia. Along the coast of Peru are the rich deposits of guano. The absence of railways and the cost of building them are serious drawbacks to the fullest development of mining in these two countries.

Commerce and Trade. Commerce and trade develop very slowly in these lands on account of the small buying power of the bulk of inhabitants and the fact that they do not want much.

CHILE

In General. This country, over 2,600 miles long and very narrow, has a wide variety of climate. In the northern region, we find the chief activity to be mining. Here are found great quantities of nitrate, copper, iron, and silver. Iodine is also a product of this region. Over 90 per cent of the exports of Chile are mineral products.

Farming is carried on in the central portion of the country where wheat, fruits, dairying, and sheep raising are important. The southern region is very cold and wet, and while there are abundant forests in this section, its remoteness from the markets of the world prevents lumbering from being a profitable undertaking.

Manufacturing. Chile is the best endowed of all the South American countries for becoming a manufacturing nation. It has a good climate; plenty of coal, iron, and copper; water power; raw materials like wool and wheat; and also plenty of capital. Its chief industries are the making of shoes, the manufacture of woolen and cotton textiles, flour milling, and tanning.

Transportation. Chile is well supplied with railways, having over 6,000 miles of them. The Trans-Andean Railway, connecting Santiago with Buenos Aires, gives Chile access to the Atlantic seaboard. Because of the excessive cost of operating this road, the freight and passenger rates are very high. As a result, little freight and relatively few passengers are carried.

LA PLATA RIVER COUNTRIES

Argentina. Argentina has an advantage in that it is peopled almost entirely by people of European stock, and also, that it is in the sub-temperate and temperate zones. The extreme northern part of Argentina is a forest where some of the most valuable hard woods are to be found. Perhaps the most valuable tree of this region is the quebracho, which is rich in tannic acid and is therefore a valuable product for this great cattle raising area.

Agriculture. The northern region is also noted for its excellent cotton growing section which, on account of the climate, cheap labor, and absence of the boll weevil, is very prosperous. The chief cereal of Argentina is wheat which is a prominent article of export. The level nature of the ground permits modern methods of sowing and harvesting, and places Argentina in the front rank of food producing countries. Argentina is also a leading producer of flax.

Near the foothills of the Andes in the province of Mendoza is a great fruit growing and wine producing area. The great plains, or pampas, afford a most natural feeding ground for cattle. Live stock raising and meat packing play a greater part in the economic life of this country than in any other country in the world. This is largely due to the fact that these plains lie close to the sea, which facilitates the transportation of meat products, and also because of the mild climate of this region, which permits grazing all the year. Argentina ranks second among the nations of the world as an exporter of meat products.

Transportation. Aside from river transportation, Argentina has the largest system of railways in South America, something over 25,000 miles in length. In the matter of roads for automobiles, it is not so well equipped although near the larger cities are to be found first-class roads.

Manufacturing. The manufacturing of Argentina is mostly of the simple type. It lacks two vital factors for the full development of its industrial life, namely, power and metals. The principal types of manufacturing are slaughtering, meat packing, tanning, cotton and woolen textile manufacturing, wine making, and sugar refining.

Minerals. As stated above, Argentina is lacking in metals. Some petroleum, however, is found south of Buenos Aires, and tungsten is to be found in the north central region.

URUGUAY

In General. The commerce and business of this little country are largely given over to meat production. The aristocratic type of farming with large holdings and absentee ownership is most characteristic of this country. The people are mostly concerned in furnishing food and raw materials. Aside from cattle and sheep raising, the people are engaged in meat packing and in the production of beef extract.

Uruguay is the smallest country on the continent of South America. It is a country of one main industry, namely, cattle and sheep raising. The Spanish element, true to its tradition, prefers pastoral pursuits to agricultural. This has encouraged large landholdings, which accounts in part for the small population of this country. The owning of most all the land by a few wealthy families is the greatest obstacle to a rapid development of agriculture.

Aside from meat packing and the making of beef extract there are no manufactures worthy of note. Meat packing is profitable here as in Argentina, due to refrigerator ships.

PARAGUAY

In General. Paraguay, like Bolivia, is a landlocked country. But unlike Bolivia, this country has a large navigable river about which centers most of the economic life of the country. It is more agricultural than Uruguay, raising considerable tobacco, sugar-cane, cotton, rice, oranges, and mate or Paraguay tea.

An interesting event happened in 1927 which may affect the economic life of this country. A large body of Mennonites from Canada and the United States moved into Paraguay. These people are a peaceful and industrious class and will do much for agriculture.

BRAZIL

In General. Brazil is the largest of all the countries in South America. Here is a country of vast distances, equal in size to the United States. Its foreign trade is exceeded by that of Argentina, largely because so great a precentage of its people are of a primitive nature. It is said that over 80 per cent of the population is illiterate.

Brazil is an agricultural country; coffee furnishes the largest item of export. Approximately 65 per cent of the world's supply of coffee comes from Brazil, and most of this coffee is grown in the two states of Sao Paulo and Minas Geraes. Brazil is also seventh in the production of tobacco. Other crops of considerable importance in this country are cotton, sugar, cacao, corn, rice, potatoes and wheat.

Forests. An immense forest, filled with a large variety of lumber, covers the plain of the Amazon. Lack of transportation facilities prevents its full use. The most valuable wood of this region was the rubber tree. Before the days of plantation rubber, the wild rubber of Brazil was in much demand. While this wild rubber from the Amazon region is of good quality, it cannot be produced as cheaply as plantation rubber for consumption in the foreign market; hence, there has been a marked decline in this industry along the Amazon. This huge tropical forest contains many other valuable woods, like ebony, lignum vitae, and rosewood.

Along the eastern section in the highlands, is another forest, rich in pines yielding gums and rosin, and medicinal plants. This forest is situated nearer the bulk of population and is, therefore, of greater present value.

Transportation. No other country in the world has so magnificent a system of waterways as has Brazil. The great Amazon River system is navigable for many thousands of miles. Unfortunately, it flows through a region poorly adapted for dwelling purposes, and hence does not play the part in the economic life of Brazil that the Paraguay and Parana Rivers do in the economic life of the countries in the temperate zone.

The railways of this region are, for the most part, in the southeast, and most of them are government owned. A handicap in their use is that hardly any two systems have the same gauge, which makes through rapid transit impossible.

Manufacturing. Like all South American countries, Brazil does relatively little manufacturing. This country has plenty of water power and large undeveloped iron resources, but the labor supply, coal, and market are lacking. Characteristic manufactures of this region are textiles, hats, shoes, clay products, wood products, tobacco, and matches.

TEXT QUESTIONS

1. Name the principal export products of Colombia.
2. How does the geography of Colombia hinder its trade?
3. What are the chief crops of Venezuela?
4. What are the advantages and disadvantages of the Orinoco plains for cattle raising?
5. What well known commodity is manufactured in Ecuador?
6. Locate the following cities: Bogota, Rio de Janeiro, Montevideo, Buenos Aires, Iquique, Rosario.
7. What important mineral is found in Bolivia?
8. Name the leading article of export from each of the following countries: Brazil, Chile, Argentina, Colombia, Venezuela.
9. What is the greatest obstacle to a rapid development of agriculture in Uruguay?
10. Why does the Amazon River play so small a part in the economic life of Brazil?

PROBLEMS AND PROJECTS

1. Find out with what South American countries the foreign trade of the United States is carried on most extensively. Write a brief report on the character of this trade.
2. Compare Argentina with the United States as to (a) topography, (b) climate, (c) industries, (d) imports, (e) exports, (f) countries with which each trade.

3. Brazil is approximately as large as the United States and contains a wealth of forest products and minerals. How do you account for the relative backwardness of this great nation?
4. Why has Argentina developed so much faster than any other South American country?

TOPICS

1. Ecuador and its cacao groves.
2. Sheep raising in Patagonia.
3. Difficulties of travel in Colombia.
4. Argentina, the future granary of the world.
5. Railroad building in South America.

FOR CLASS DISCUSSION

1. The best interests of Argentina, Uruguay, and Paraguay require that these countries unite into one nation which might be called the United States of South America.
2. Chile will become the leading manufacturing nation in South America.
3. Politics and government are the greatest obstacles to South American trade development.

CHAPTER XXV

EUROPE

In General. No other continent in the world has had more influence on the development of art, education, trade and government than the continent of Europe. The word "European" is synonymous with what we understand by the word "civilization." In fact, such civilization as we have came from this continent. It was from this continent that sailors and merchants eager to find new markets dared to circumnavigate the globe during the sixteenth century. Since then, European culture, business methods, and products have been invading all parts of the world.

Why has Europe played so important a part in the commerce and industry of the world as well as in the government of the world? There are, of course, many answers to this question, but geography has undoubtedly played a most prominent part in causing this continent to be a leader among the continents of the world.

No other continent in the world has so many miles of seacoast. In no other continent are there so many deep indentations which bring all the different parts of the country within easy communication. No part of Europe with the exception of the eastern section, is more than six hundred miles from the sea. By far the largest portion of the continent is within three hundred miles of salt water. This factor alone had the tendency to encourage trade and travel in the Middle Ages, and did much to bring the people of the various parts of the continent into touch with each other. This is important for, when people travel, their wants tend to increase and trade and commerce are stimulated.

Another factor that has helped Europe maintain its leadership is its mild climate. This is caused by the prevailing westerly winds blowing over the warm gulf stream. According to its latitude, Europe would be frigid to a large extent. For example, the British Isles are in about the same latitude as Labrador, while the most of Europe is north of the latitude of New York City. Because of the east-west trend of the mountains, the winds can carry moisture and warmth far inland over the great European plain. This makes an agreeable climate which is highly favorable to agriculture and other human activities.

SECTION 1

THE BRITISH ISLES

In general. No modern nation in the world has profited more from her geographical position than England. During ancient times, and even down to the discovery of America, these islands were on the edge of the world. After the discovery of America, these islands found themselves in the center of the world, with lines of trade coming to them from the western hemisphere. At the same time, they face the broad open European plain on the south and east. This position, therefore, has made the British Isles the great distributors of commodities and England, the greatest commercial nation in the world.

The insular position of England has also had much to do with her development, for being entirely surrounded by water, England has been less subject to invasion by foreign armies, and, hence, her resources have been preserved from the waste that invading armies cause in an enemy country.

The supremacy in Europe of the British people in manufacturing, trade and commerce is due in the main to the following factors:

1. Their insular position.
2. Their central location in relation to Europe and the Americas.
3. The deep harbors.
4. Abundant supplies of coal and iron.
5. Favorable climate.
6. Mixed race: Celt, Saxon, Dane, and Norman.
7. Inventive genius.

Agriculture. In the Middle Ages, the population supported itself by producing its own necessities. Today, the entire group of islands is largely dependent on other nations for its supply of food. The limited area of land surface and the owning of large estates by aristocratic families have forced the agriculture industry to be largely of the small farm type.

The climate of this entire region is more favorable to cattle and sheep raising than to agriculture, and for centuries, England and the other countries comprising the British Isles have been famous for their cattle and sheep. Cattle and sheep are even now fairly numerous. The principal crops are barley, oats, potatoes, and flax, the last being a product of Ireland.

Minerals. It is from their mineral resources that the British people have gained their greatest advantage. England is the largest exporter of coal in the world, and the British coal fields exceed in area those of the rest of Europe. The principal fields are located in northeastern England, southern Scotland, and southern Wales. In normal times the British Isles produce over 300,000,000 tons annually. Much of this is exported to other countries, colonies, and naval stations, but a large part is used to run the huge factories that turn out a great supply of manufactured products.

Manufactures. Because of the presence of coal and also of improvements and inventions, especially in the spinning and weaving of cloth, England was able at the beginning of the nineteenth century to outstrip all rivals. With plenty of fuel and machinery that could be operated by cheap labor, she was able to strengthen her place in the industrial world.

As a result, we find industrial England located in the north near the coal fields and also near the former pasture lands of sheep. Wool was the first industry of prominence in this locality. We find the woolen industry in such cities as Leeds, Bradford, Halifax, Huddersfield, and Leicester. Leeds is one of the greatest industrial cities in England and is first in the manufacture of wholesale clothing. It is also a large manufacturer of iron and steel.

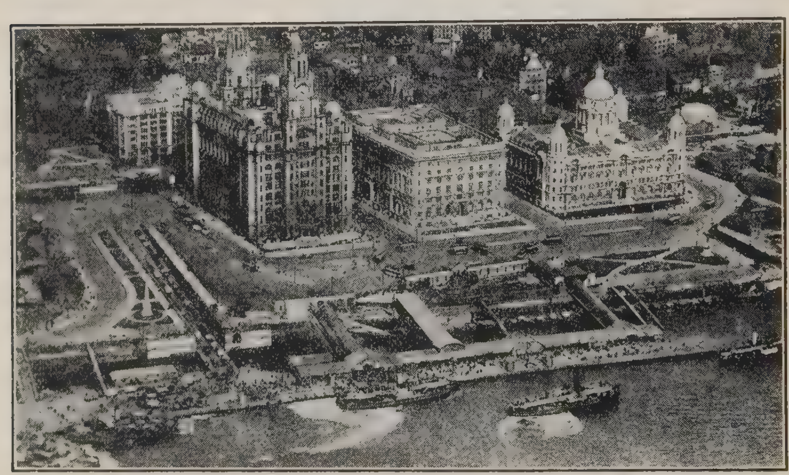
The cotton industry is located on the western slope of the Pennine Range, where the moisture from the ocean winds is very favorable for the spinning of cotton. This industry centers largely in Manchester and the surrounding cities of Oldham, Bolton, Blackburn, Burnley, and Preston. The raw material has to come from across the seas to these huge factories, most of the cotton coming from the United States.

(Keystone View Company, Inc., N. Y.)

FIG. 194. HOUSE OF PARLIAMENT, LONDON

Other types of manufacturing, such as shipbuilding in Glasgow, Newcastle and Belfast, are also to be found. Tin is still obtained from the mines of Cornwall after centuries of production. Lead, zinc, and copper are smelted at Swansea near the Welsh coal fields. Blast furnaces for smelting iron ore are found chiefly in Middlesborough, while special types of hardware and cutlery are made in Birmingham and Sheffield.

Cities. The largest city of the British Empire is the city of London. That a large city should grow up at this point on the Thames was determined by geographical location. The Thames is an estuary for a considerable distance, and faces the great rivers, the Rhine and the Scheldt, which invite commerce to cross the channel. Its position as the gateway of southern England has made this city one of the principal distributing centers in the world. English vessels bring the wares of the various countries of the world to London and then reship them to other ports. It is today the world's greatest market for tea.



(Photograph by Ewing Galloway, N. Y.)

FIG. 195. THE DOCKS AT LIVERPOOL

The principal city and port on the western coast of England is Liverpool. This city, situated on the estuary of the Mersey River, has become the great port for ship lines from America. Through this port most of the cotton, wheat, meat, and tobacco are received.

Other ports of importance are Cardiff, the chief port for exporting anthracite coal; Manchester, which is reached by the Manchester ship canal and the Mersey River; Hull, located on the Humber River; Glasgow, in Scotland; and Belfast, in Ireland. Belfast is the center of the flax growing region so the manufacture of linen is important here; large shipbuilding works are also in this city. Another city in Ireland which is of some commercial importance is the city of Londonderry. This city has been called the "Troy of the Old World" in that it is a great center for the manufacture of shirts, collars, and cuffs.

FRANCE

In General. France has the advantage of fronting on two large seas. These two fronts, the Atlantic and Mediterranean Sea, are factors that have done much to determine the political, religious and commercial life of this country. The broad, level plain to the north, with the ports of Havre and Bordeaux, opening toward England and America, has given France a share in the world's international trade, while the Mediterranean front has made her a potent factor in the trade with Africa and the Orient.

Agriculture. On account of the excellent climate and fertile soil, France is able to grow a large amount of agricultural products. The crowded condition of the country has made intensive farming a necessity. The small farms of France yield more wheat per acre than those of any other country except Belgium where like crowded conditions prevail. About one-half of the country of France is under cultivation, the principal crop being wheat. The general average yield of wheat is about 21 to 25 bushels per acre. This yield, compared with the yield of 12 to 15 bushels per acre in the United States, and 10 bushels per acre in Argentina, is an example of what intensive tillage would do towards increasing the supply of food in the western hemisphere.

Next to cereals, the most characteristic French crop is fruit. Because of the mild climate, the grape can grow in all sections of the country. The principal region for grapes, however, is in the north of France in the Champagne district. Other sections where grapes are grown in considerable quantities are in the Rhone district and around Bordeaux along the Garonne River.

Minerals. France is relatively poor in minerals as compared with other great nations of the world. Her largest deposits are in the northern provinces. The recent acquisition of Alsace-Lorraine and the Saar Basin has increased the area of coal fields to a considerable extent. Here, also, are large deposits of iron ore. The mineral resources of the country west of the Rhine have been one of the causes of much of the strife between the German and French nations for many centuries.

Manufactures. French manufactures reflect, in a great measure, the temperament of the Latin races. Here manufacturing does not concern itself so much with quantity and bulk, but more with artistic designs and value. Hence, we find that the characteristic French manufacturers are, for the most part, concerned with the making of silk fabrics, china and glassware, scientific instruments, jewelry, embroideries, wines, and the canning of sardines and the small potatoes that are used in the high class restaurants of the large cities of the world.

(Photograph by Ewing Galloway, N. Y.)

FIG. 196. A RURAL SCENE IN FRANCE

Another industry which is typical of the French nation is the manufacture of the fine kid glove. The glove industry at Grenoble, in southeastern France, has for many centuries been prominent. Hundreds of thousands of wild goats, which formerly furnished the raw material for this glove industry, pastured on the nearby mountain sides. Nowhere in the world are kid gloves made that are of finer quality than the gloves of Grenoble in France.

Routes. France was one of the first nations to become a united country during the Middle Ages, and later became one of the leading commercial nations. A geographic factor that has favored the political and commercial unity of this country is its splendid system of rivers, which make all parts of the country accessible.

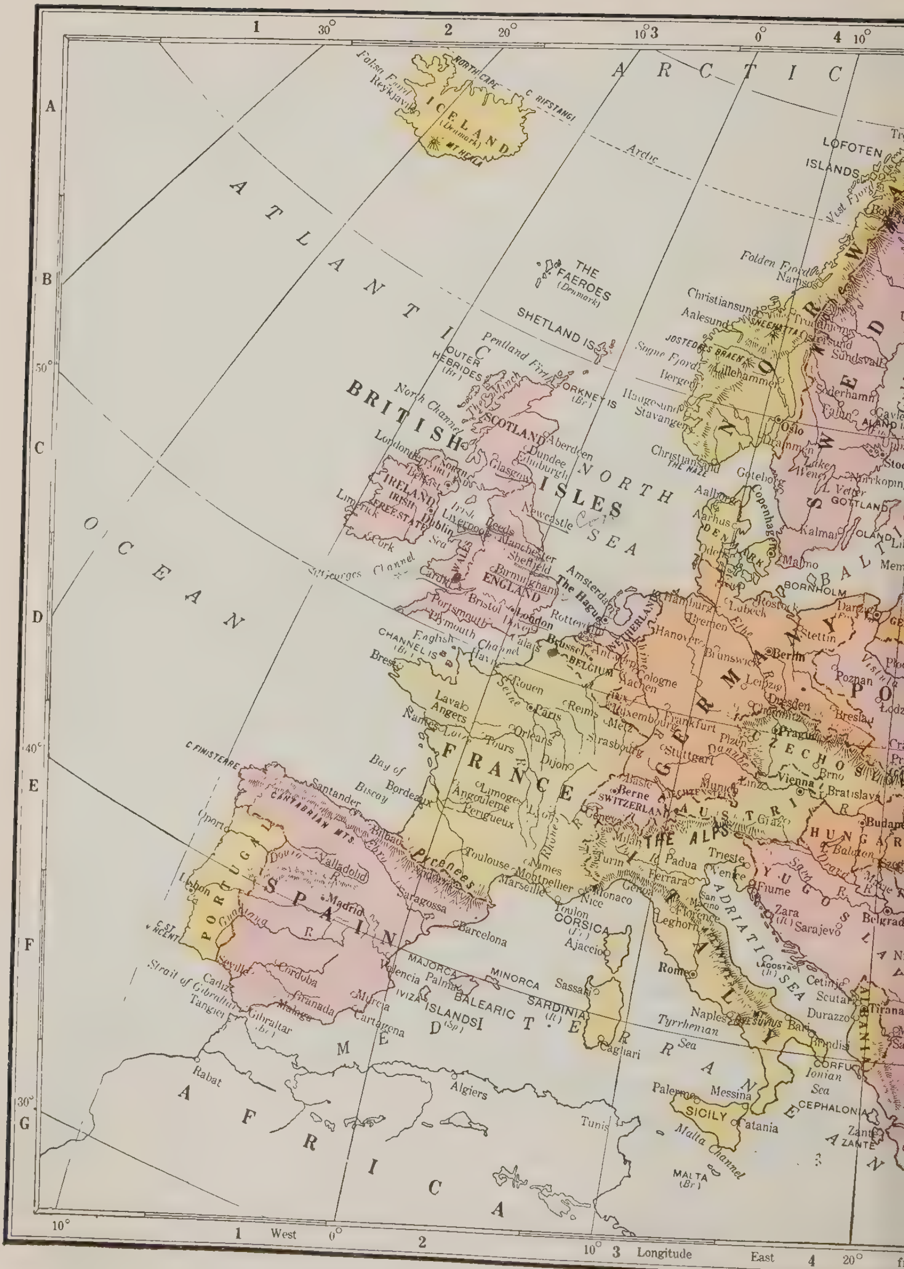
Most all of these rivers are navigable, and the various systems are connected by a system of canals which makes possible the reaching of all points on the various rivers by boat. In the early days this was an important factor in uniting the people. The chief rivers are the Seine and Moselle in the north, the Loire and Garonne in the west, and the Rhone in the east and south. The Rhone is the least valuable of all these routes, largely because of its swift current and poor outlet into the sea.

France has a number of important railways leading into the surrounding nations. The most prominent are the routes from Paris to Berlin, Paris to Vienna, and Paris to Turin in Italy. The first two follow either the plain or passes through the low mountains to the east. The road to Italy reaches that country through the famous Mt. Cenis tunnel. A line also reaches around the end of the Pyrenees to Barcelona, in Spain, making it virtually a French port.

Although France has a favorable position for commerce, with excellent river and railroad systems, and a coast facing on two seas, yet she is almost stationary in population and trade. The coast has no natural harbors. The principal harbors are Havre, Bordeaux, Dunkirk and Marseilles. Out from these ports goes a large amount of exports of considerable value, but because of the importation of very few raw materials, the ships returning to France are not usually loaded, as is the case with ships returning to Great Britain. This, in a measure, accounts for the fact that France is not able to compete with England as a commercial nation.

GERMANY

In General. Since 1871, Germany has made remarkable developments in commerce and industry, and, previous to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NORTH CAPE
C. RIFSTANGI
MT HEKLA
LOFOTEN
ISLANDS
Vest Fiord
Folden Fiord
Namsos
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(Denmark)
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ORKNEY IS.
(Br.)
Pentland Firth
OUTER HEBRIDES
(Br.)
The Minch
BRITISH ISLES
North Channel
SCOTLAND
Aberdeen
Dundee
Edinburgh
Glasgow
Londonderry
NORTHERN IRELAND
Belfast
IRELAND
IRISH FREE STATE
Limerick
Dublin
Cork
Irish Sea
Liverpool
Leeds
Newcastle
Manchester
Sheffield
WALES
Birmingham
ENGLAND
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Portsmouth
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CHANNEL IS.
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Christiansund
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SNEEHATTA
Trondhjem
Ostersund
Sundsvall
JOSTEDALS BRAEN
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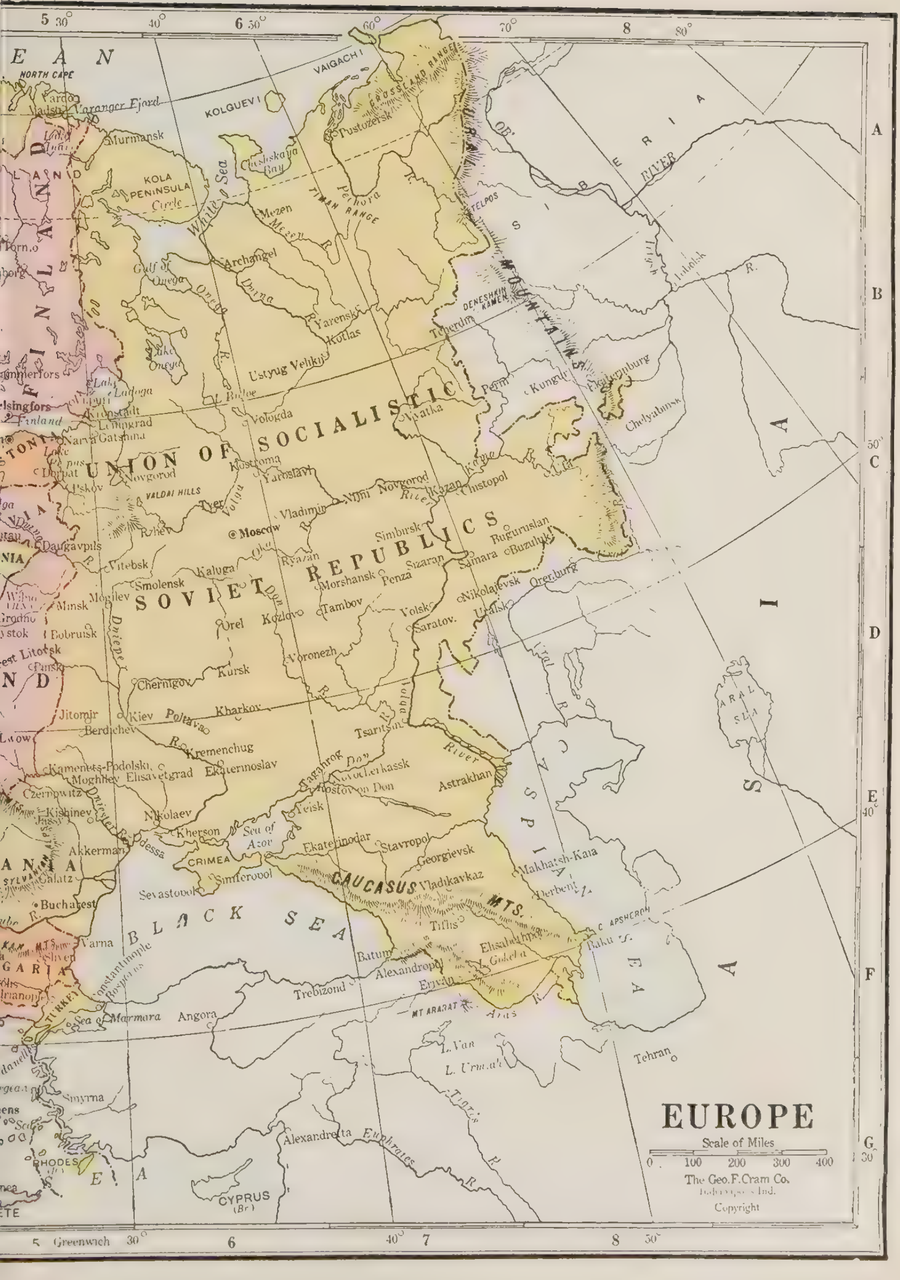
Sogne Fjord
Bergen
Haugesund
Stavanger
NORWAY
SWEDEN
Soderhamn
Falun
Gavle
ALAND IS.
Upsala
Oslo
Drammen
Christiansand
THE NAZE
Stockholm
Goteborg
L. Vener
L. Vetter
Norrkoping
GOTTLAND
Kalmar
OLAND
Aalborg
Aarhus
DENMARK
Odense
Copenhagen
Malmo
BORNHOLM
BALTIC
Memel
Danzig
Amsterdam
The Hague
Rotterdam
NETHERLANDS
Brussels
Antwerp
BELGIUM
Calais
Havre
Brest
Rouen
Seine
Paris
Reims
Laval
Angers
Nantes
Loire
Tours
Orleans
Dijon
Luxembourg
Metz
Strasbourg
FRANCE
Bay of Biscay
Bordeaux
Limoges
Angouleme
Perigueux
Lyon
Rhone
Toulouse
Nimes
Montpellier
Marseille
Toulon
Nice
Monaco
Pyrenees
Andorra
Hamburg
Lubeck
Rostock
Bremen
Elbe
Hanover
Brunswick
Berlin
Stettin
GERMANY
Cologne
Aachen
Rhine
Leipzig
Dresden
Chemnitz
Frankfurt
Stuttgart
Munich
Danube
Prague
CZECHOSLOVAKIA
Plzen
Brno
Linz
Vienna
Bratislava
Poznan
Breslau
Lodz
Vistula
POLAND
Basle
Berne
SWITZERLAND
LIECHTENSTEIN
Geneva
AUSTRIA
Graz
THE ALPS
Milan
Turin
Padua
Venice
Trieste
Ferrara
Genoa
Fiume
Po
ITALY
Florence
Leghorn
San Marino
ADRIATIC SEA
CORSICA
(Fr.)
Ajaccio
SARDINIA
(It.)
Sassari
Cagliari
Rome
Naples
Vesuvius
Bari
Brindisi
Tyrrhenian Sea
Palermo
Messina
SICILY
Catania
Malta Channel
MALTA
(Br.)
HUNGARY
Budapest
L. Balaton
Drava
Sava
YUGOSLAVIA
Zara
(It.)
Sarajevo
Belgrade
LAGOSTA
(It.)
Cetinje
Scutari
Durazzo
Tirana
ALBANIA
CORFU
Ionian Sea
CEPHALONIA
Zante
ZANTE
C. FINISTERRE
Santander
CANTABRIAN MTS.
Bilbao
Ebro
Oporto
Douro
Valladolid
PORTUGAL
Lisbon
Tagus
Madrid
SPAIN
Saragossa
Barcelona
Guadiana
C. ST. VINCENT
Seville
Cordoba
Granada
Malaga
Cadiz
Strait of Gibraltar
Gibraltar
(Br.)
Tangier
Valencia
Murcia
Cartagena
MAJORCA
MINORCA
Palma
IVIZA
BALEARIC ISLANDS
(Sp.)
M E D I T E R R A N E A N
Rabat
Algiers
Tunis
A F R I C A
10°
1
West
0°
2
10°
3
Longitude
East
4
20°

F


EUROPE
Scale of Miles
0 100 200 300 400
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Indianapolis Ind.
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UNION OF SOCIALISTIC SOVIET REPUBLICS
SIBERIA
ASIA
URAL MOUNTAINS
BLACK SEA
CASPIAN SEA
ARAL SEA
CAUCASUS MTS.
NORTH CAPE
Varanger Fjord
Vardo
Vadso
Murmansk
KOLGUEV I.
VAIGACH I.
GROSSLAND RANGE
Pustozersk
Cheshskaya Bay
White Sea
KOLA PENINSULA
Arctic Circle
TIMAN RANGE
Pechora R.
Mezen
Mezen R.
Archangel
Gulf of Onega
Onega R.
Dvina R.
Yarensk
Kotlas
Lake Onega
Ustyug Veliki
Vologda
Lake Ladoga
Kronstadt
Leningrad
Gatshina
Narva
Lake Peipus
Dorpat
Pskov
Novgorod
VALDAI HILLS
Tver
Volga
Kostroma
Yaroslavl
Rzhev
Vladimir
Moscow
Nijni Novgorod
Kazan
Chistopol
Vyatka
Perm
Kungur
Ekaterinburg
Chelyabinsk
Tobolsk
Irtysh
Ob' River
TELPOS
DENESHKIN KAMEN
Teherdin
Kama
Ufa
Simbirsk
Samara
Syzran
Buguruslan
Buzuluk
Orenburg
Nikolaievsk
Uralsk
Ural R.
Volsk
Saratov
Penza
Morshansk
Tambov
Ryazan
Oka
Kaluga
Smolensk
Vitebsk
Daugavpils
Mogilev
Minsk
Bobruisk
Orel
Kozlovo
Kursk
Voronezh
Don R.
Dnieper
Chernigov
Kiev
Poltava
Kharkov
Jitomir
Berdichev
Kremenchug
Ekaterinoslav
Kamenets-Podolsk
Moghilev
Elisavetgrad
Czernowitz
Kishinev
Jassy
Dniester R.
Nikolaev
Kherson
Odessa
Akkerman
Galatz
Bucharest
CRIMEA
Simferopol
Sevastopol
Sea of Azov
Taganrog
Novocherkassk
Rostov on Don
Yeisk
Tsaritsin
Volga R.
Astrakhan
Ekaterinodar
Stavropol
Georgievsk
Vladikavkaz
Makhatsh-Kala
Derbent
C. APSHERON
Baku
Tiflis
Elisabethpol
Batum
Alexandropol
Erivan
Aras R.
MT. ARARAT
Trebizond
Angora
Varna
Constantinople
Bosporus
Sea of Marmara
Smyrna
RHODES
CYPRUS (Br.)
Alexandretta
Euphrates R.
Tigris R.
L. Van
L. Urmia
Tehran
FINLAND
Helsingfors
Viipuri
Gulf of Finland
ESTONIA
LATVIA
LITHUANIA
Wilno
Grodno
Bialystok
Brest Litovsk
Pinsk
POLAND
Lwow
RUMANIA
TRANSYLVANIAN ALPS
BULGARIA
Sliven
TURKEY
CRETE
AEGEAN SEA
Athens
OCEAN
Greenwich
5 6 7 8
A B C D E F G
30° 40° 50° 60° 70° 80°

the Great War in 1914, was easily the greatest competitor of Great Britain in the matter of trade. Even today, Germany possesses much of the natural resources that she had before the war, and the nature of the climate, soil and people is such as to warrant their playing an important part in the commerce and industry of the future.

Agriculture. Because of the limited area of German territory and the sandy structure of the soil, which requires constant attention and the application of fertilizers, it is but natural that scientific farming should develop to a high degree in this nation. Most of the soil in northern Germany is relatively infertile. In order to feed a fast growing population, the German agriculturist turned to a study of his soils and soil chemistry.

While considerable wheat is grown, the cool and moist summers make the growing of root crops, such as sugar-beets and potatoes, more important and profitable. Rye and oats are other staple crops of importance. The sugar-beet, however, is the chief agricultural crop. This crop can be grown with profit on account of the supply of cheap labor, which is most essential to enable this crop to yield the greatest returns. The chief center of sugar beet production is the region around Magdeburg.

Minerals. In proportion as nations have been able to utilize their mineral wealth, especially coal and iron, have they secured a leading place in the commerce of the world. For this reason England, the United States, and, to some degree, France were early in entering into competition for world commerce.

Up to 1871, Germany was a rural nation of small farmers. It was only after she utilized the mineral resources at her command that this nation became a rival for world trade, and became one of the great industrial nations of the world. Deposits of iron, silver and lead are found in the Harz and Erzgebirge mountains. Coal is scattered over a wide area, though some of the best fields are in the Saar Basin, which was under the control of the French for some time after the

World War. The need for new fertilization of the soil was instrumental in the development of the great potash fields.

Manufactures. Iron and steel industries form the major portion of German manufacturing, especially the manufacture of machinery and scientific instruments of great value. Textiles, especially cotton, woolen, and silk, also hold a prominent place in manufactures. Beet-sugar refining and the making of chemicals play a large part in the commercial and industrial development of the land.

It is interesting to note how there was an apparent relation between the chemical plants and munition plants. The fact that dye factories could be changed into munition plants accounts, in a measure, for the keen interest the German government and people took in the dye industry.

The chief centers for the manufacturing of iron and steel are Dusseldorf, Essen, Stettin and Kiel; the chief center of silk goods is Kiefeld; cotton goods, Munchen; dyes, Elberfeld; chinaware, Meissen; toys and electrical machinery, Nuremberg.

Routes. In the matter of railway communication, Germany was in the lead of other European countries in mileage. Like the railways of England and France, which center in London and Paris, the railways of Germany center in its capital at Berlin. A net work of lines run out from this city to all the chief ports and other points in the interior. Lines run to Rotterdam, to Switzerland, Italy and Constantinople.

Five great rivers enter the sea from the interior, which, with the canals joining them, give over seven thousand miles of water navigation. The rivers are the Rhine, the Ems, the Elbe, the Weser, and the Oder. Three of these rivers, the Rhine, the Ems and the Weser, flow into the North Sea; the others flow into the Baltic. The most important German port is Hamburg. This port, located on the Elbe River, is one of the natural gateways for goods entering Europe from England and America. It is the only natural Atlantic port that Germany possesses. Next important to Hamburg, as a seaport, is the city of Bremen on the estuary of the Weser.

Future Outlook. Although Germany is surrounded by other nations, her position for commerce is far from unfavorable. Occupying a large portion of the northern plain in Europe, Germany is in the pathway of routes following the line of least resistance. In one sense, Germany is at the crossroads of commerce. By her system of canals and railways, she is able to attract commerce from the Mediterranean countries, as well as a share of the commerce moving east and west.

BELGIUM

In General. Belgium has a better geographic location for commerce and trade than any other continental country in Europe. It has the advantage of being directly opposite the great ports of the greatest commercial and industrial country in Europe. This position, therefore, makes this country commercial rather than agricultural.

The presence of iron and coal near by, together with markets in abundance, is a further reason why this country turns to manufacturing rather than to agriculture. This is the most densely populated country in Europe, having about 659 persons per square mile. Such a dense population could not possibly get its food from the soil, and, hence, has to turn to some other activity to gain a livelihood.

Belgium is a great hive of industry, the chief products of which are linen, carpets, lace, and diamonds, which are cut in this country. It is the greatest lace manufacturing country in the world. Steel works abound, especially near the iron and coal fields of the southern section. Glass working is another special type of manufacture based on the minerals close at hand.

The industries are centered as follows: lace and carpet manufacturing in Brussels; woolen industry in Verviers; linen in Ghent; the making of steel and smelting of zinc in the Liege district; glass manufacturing in Charleroi.

The great commercial city of Belgium is Antwerp, the city of which Napoleon said "held a dagger pointing toward the heart of England." This city lies some miles up the Scheldt River, and boats which wish to reach it must first pass through Dutch territory. Antwerp, however, is one of the great ports of the world, being a close rival of New York, London, and Liverpool in the matter of tonnage clearances. In this city, the diamond industry of Belgium has centered.

(Photograph by Ewing Galloway, N. Y.)

FIG. 198. A CANAL SCENE, HOLLAND

HOLLAND

In General. Another small country which is very important commercially is the little kingdom of Holland. This country, with rich colonies in the East Indies, has become commercial rather than industrial. Since the sixteenth century, Dutch traders have brought to Europe the spices and fruits of the Far East. Because of this fact, Holland imports and exports the same commodity. A glance at her imports shows that spices, coffee, sugar, tobacco, and indigo hold a prominent share of that trade, while at the same time, these same goods enter into her export trade in nearly the same quantities. Holland, therefore, is a great distributor of goods and from her position on the north sea and at the mouth of the Rhine and Scheldt, she becomes a natural gateway to the plains of Europe.

Commerce and Industry. The people of Holland have long been noted as breeders of dairy cattle. This is the home of the famous Holstein-Friesian cow, which today holds a leading place as a milk producer. The abundance of rainfall makes this country an excellent pasture for dairy stock.

The Dutch have also become famous as horticulturists and growers of vegetables. The tulip and hyacinth have been among her chief flowers for the markets of England and France. England is the great market for most of the vegetables of this country.

MEDITERRANEAN COUNTRIES

In General. South of the Pyrenees and Alps are the two countries of Spain and Italy. The climate of these countries is largely subtropical. Both of these countries have, in the past, played a large part in the affairs of the world, but today do not rank with their more northerly neighbors.

Spain. Spain, like France, faces two oceans or seas, but unlike France, it is not able to take advantage of this position. This is largely due to the uniform coast line, backed up by a high plateau region through which no large navigable river can reach the interior. In natural resources, no country is better endowed as there is an abundance of coal, iron, copper, zinc, lead, sulphur, gold, and silver. Bilboa, on the northern coast is the principal industrial center, being located near the large iron deposits. On the western coast, the city of Barcelona is the chief seaport, this being the terminus of a railroad leading north into France.

The great plateau region, however, affording no natural routes to the Mediterranean or the Atlantic, together with the character of the race, accounts in a large measure for much of the lack of industrial and commercial development in this nation.

Most of the productive soil of Spain is unsuitable for agriculture. There are considerable natural grasslands which have made the average Spaniard turn to herding rather than to agriculture. This country is a land of sheep raising; the sheep migrate between highlands and lowlands with winter and summer. Here is the home of the famous merino sheep, noted particularly for its fine wool. Other animals characteristic of this region are horses, mules, and goats. Because of the dryness of the climate, there are no forests in Spain although the oak and the chestnut are found in the more moist regions in the north. The chief forest product of Spain is cork, and from here comes the world's chief supply of that wood. It grows mostly in the northeastern section of Spain in a very mountainous part of the country.

Italy. During the thirteenth and fourteenth centuries, Italy was the chief commercial nation of Europe. At that time, it was located in the center of the civilized world and was the point of convergence of all the routes from the Orient, Africa, and northern Europe. Since the discovery of America and the rounding of the Cape of Good Hope, this country has lost much of its ancient importance as a commercial center.

The northern part of Italy is rich and prosperous, both from the standpoint of agriculture and manufacturing. The rich soils of the valley of the Po afford an excellent, though limited, field for growing wheat, barley, and rice. Here, also, are the larger cities, especially Milan, noted chiefly for its silk manufactures. Cotton is manufactured at Genoa, and woolens at Turin. In the southern section, farming is much poorer and there is practically no manufacturing of any kind. Naples, the largest city in Italy, is noted chiefly as a port of call for passenger traffic.

Italy is also poor in mineral products as well as in forest products. There is very little coal, a little iron, and no petroleum. There is some zinc, lead, and quicksilver. The most important mineral of Italy is sulphur. The annual output of this mineral is over 300,000 tons.

The commerce of Italy is largely concerned with the exportation of raw silk, fruits, and textiles. The climate is especially adapted to the growth of the mulberry tree on which the silk worm thrives, while the climate and soil make grapes and wine, olives and olive oil, lemons, oranges, figs, and nuts characteristic products for export. An important factor in the wealth of Italy is the large number of emigrants to other nations. These people, through dint of work and saving, annually send to the relatives and friends in the mother country hundreds of thousands of dollars.

Greece. Greece is the smallest and perhaps the least important commercially of the Mediterranean countries. Nature has provided Greece with an indented coast and many good harbors, but the rugged nature of the mountains back from those harbors has prevented their being used to advantage. In the ancient times, when Greece was the center of the known world, her cities and the country round about them were prosperous and flourishing. Today Greece is out of the line of the great trade routes, even more than Italy and Spain.

The almost rainless summers compel the use of irrigation for agriculture. The principal occupation of the people is farming, and the chief products that enter into the world commerce are vineyard crops consisting of grapes, currants, and olives. Figs and tobacco are also produced in considerable amounts.

A few minerals are found in small amounts, such as iron, zinc, gold, and silver, and some progress has been made in manufacturing, especially since the World War.

TEXT QUESTIONS

1. What geographic advantages does the continent of Europe have?
2. How have the British Isles profited by their geographical position?
3. Account for the leadership of the British in commerce and industry.
4. What important mineral is found in England?

5. Why is cotton manufacturing of England on the western slope of the Pennine Range?
6. Locate each of the following cities: Liverpool, Cardiff, Hull, Glasgow, Belfast.
7. What is the character of French manufactures?
8. How has geography favored the political and commercial unity of France?
9. Name and locate the chief seaports of France.
10. Why did scientific farming first attract the attention of the Germans?
11. How has place geography favored Belgium? How has it hindered?
12. Why do the same articles appear among the lists of the exports and imports of Holland?
13. What are the main articles of export of Spain? Italy? Greece?

SECTION 2

SCANDINAVIAN COUNTRIES

In General. A study of these countries includes the nations of Denmark, Norway, Sweden, and Finland. None of these nations enters into the commerce of the world to a large extent, principally on account of small size and a lack of coal which is a serious handicap.

Denmark. To a large extent, Denmark is a sandy, level plain almost entirely surrounded by water from which comes much raw and rainy weather. Farming is, therefore, one of the few occupations of the country; we find hay, oats, beet-sugar, butter, cheese, and eggs as large items in export. Dairying is without doubt the chief specialty of the farmers of this country.

Denmark has one large city, Copenhagen, which is excellently located as a distributor of goods. It is situated on a water pathway leading into the central part of Europe.

Norway and Sweden. Neither Norway nor Sweden is very rich in minerals, though we do find some iron, copper, and a little silver. As in the case of Denmark, the great handicap is a lack of coal. Norway, due to its geographical position on the ocean and many good harbors, is more of a commercial nation than Sweden. This fact has enabled Norway to have a relatively large share in the carrying trade of the world. Fishing is an important industry in both countries; the Norwegians are sailors by tradition and the fishing industry has had a tremendous influence on the life of the people.

Both Norway and Sweden have considerable forest lands, those of Sweden being larger and of greater value. Considerably more than one-third of Swedish exports consist of forest products. In Norway, the principal forest products consist of pulp and matches. Bergen and Oslo are the chief commercial and industrial centers of Norway, and Stockholm and Goteborg are the chief trade centers of Sweden.

Finland. Although located far north in Europe, the climate of Finland is comparatively mild. The wealth of this country is in her forest products rather than agriculture. Over 70 per cent of the land is covered with forests, consisting of pines, firs, and birches. The fir is especially important to the paper pulp business.

Only a small portion of this country is under cultivation. The chief crops are barley, rye, flax, sugar-beets, and potatoes. The manufactures of Finland are mostly of the simple type and are concerned with the use of its own raw materials. The chief industries are timber, paper, leather, and sugar-beet refining. The principal commercial centers are Helsingfors, Abo, and Saima.

CENTRAL EUROPEAN COUNTRIES

Austria and Hungary. Both Austria and Hungary are now mere shadows of their former greatness, having lost much of their territory since the Great War.

Most of the land in Austria is not well adapted for profitable farming, and, as a consequence, Austrians can never raise enough to feed themselves. If Austria is to have any economic future, it will have to be along the lines of manufacture by using her resources of timber, water power, and minerals. Austria has large forests and deposits of coal and iron ore. The coal deposits are quite small, but the potential water power of Austria will more than compensate for a lack of a sufficient supply of fuel.

The manufacture of textiles has been a leading industry in Austria, knit goods, hosiery, and lace being most important. Silk manufacturing has also held an important place.

The country of Hungary consists of a large fertile plain where agriculture is the chief industry of a large proportion of the people. Wheat, rye, oats, sugar-beets and potatoes are raised in abundance.

The manufacturing industries of Hungary reflect the nature of her resources and are largely concerned with flour milling, the refining of sugar, and the distilling of liquors. Budapest is about the only industrial town in Hungary.

Switzerland. One would not look for commerce or industry to be of much importance in the landlocked republic of Switzerland. Here is a country with no seaport or river reaching the sea, with a mountainous topography making the soil unfit for agriculture, yet it stands in the front rank of European commerce, in proportion to its population.

Some of the reasons for this are: First, the fact that Switzerland has an abundance of water power. This resource makes up for a lack of coal. Nearly 1,900,000 horse power are used, while many times that amount is in reserve.

Second, the proximity of three great commercial nations, France, Germany, and Italy, which afford an excellent market for the products of Swiss manufacturers. These manufactures are usually products that are of small bulk and great value, which makes it possible to send them to all parts of the world. Characteristic products are watches and clocks, leather goods, embroideries and silks, chemical products, and fine machinery. The centers of industries are Zurich, Basel, and Geneva.

Switzerland also adds a great deal to its wealth on account of its wonderful natural scenery. Here we find the "playground of Europe" affording rest and sport to millions of tourists from all over the world.

Czecho-Slovakia. Czecho-Slovakia has a splendid natural boundary. It is surrounded by the Bohmerwald, Erzgebirge, and Carpathian mountains. It is but natural, therefore, that a distinct national life should grow up under such conditions. The republic is a rich agricultural country, raising large quantities of sugar-beets, hops, rye, oats and wheat. Like most of the countries in this part of Europe, the climate is of the continental type and rainfall is relatively small, but the many rivers are used for irrigating the land.

This new republic is well supplied with minerals. Large deposits of bituminous coal are found in various sections of the country. Iron ore, while not abundant, is sufficient to meet the needs of the industries of the country. Other minerals of importance found here are graphite, radium, rock salt, and nitrates.

Czecho-Slovakia, once a part of old Austria, has for a long time been important in the manufacture of textiles. With a good supply of coal, water power, and cheap labor, this country is able to compete with other nations for a market for its goods. The manufacture of silk, cotton, woolens, and linens are leading types of industry in this country. The tanning of leather and the making of shoes are especially important in Bohemia and Moravia. Chief commercial centers are Prague, Brunn, Rumburg, and Zwittau.

Poland. Poland is a country without any well defined boundary lines. It is merely an extension of the plain reaching from northern Germany through to Russia. This lack of a natural boundary line is one of the reasons why Poland has been overrun by other nations in the past.

The climate of Poland is the continental type with long hard winters and extremely hot summers. Agriculture is the main occupation of its inhabitants, the chief crops being rye, potatoes and sugar-beets. Horses and cattle are raised in considerable number.

Coal is found in the southwestern part of Poland. Petroleum is also abundant, giving rise to the refining of oil which has become an important industry in western Galicia.

There are two important centers of industry, Warsaw and Lodz. In the former, the principal products are hardware, shoes, beet-sugar and textiles. The latter city is important as a center of the textile industry.

THE BALKAN AND BALTIC COUNTRIES

In General. The countries of the Balkan Peninsula are among the most backward, economically, of all the countries of Europe. With the possible exception of Roumania, they are poor in natural resources, transportation facilities, and manufacturing industries. The great bulk of the population are farmers. The different races and languages are an almost insuperable barrier to the commercial and industrial prosperity of this region. The rugged topography has also done much to isolate the entire region.

Of the three countries, Jugo-Slavia, Bulgaria, and Roumania, the last named is the largest and most important. Roumania is relatively rich as an agricultural state, producing considerable wheat, corn, and oats. Roumania also produces petroleum, salt, and some coal, and the chief industries of this country are, therefore, petroleum refining, flour milling, and sugar refining. Bucharest, Galatz, and Kronstadt are the chief commercial and industrial centers.

The great handicap of the Balkan country is its inaccessibility. The railways are short and do not run east and west, thus connecting the various countries; with the exception of the Danube River, there is no large navigable river.

The Baltic States. Three new countries were carved out of western Russia, namely, Lithuania, Latvia, and Esthonia. All three of these countries are predominantly agricultural, over 75 per cent of the population being engaged in farming. Large quantities of flax, rye, potatoes, barley, and wheat are raised. Dairying also is growing in importance. The forests of Lithuania, consisting of pine and fir, are a most important source of wealth. Lithuania is well supplied with navigable waterways.

The industrial life of these countries is connected, for the most part, with the preparation of the agricultural produce for the market, and consists chiefly of flour milling, brewing, tanning, and lumbering.

RUSSIA

Soil and Climate. Russia may be compared geographically with Canada. In both countries, we find vast rich plains suitable for the growing of wheat and other grains.

Nearly forty per cent of Russia is heavily forested; this country, therefore, ranks as one of the foremost in the world in forest resources.

Though Russia is a land of peasants and agriculturists, the amount of land fit for cultivation is relatively limited. This is due to the large areas of tundras, forests, and salt marshes in the southeast, and swamps in the west. In the

Ukraine district, and extending eastward, is the famous black earth belt, which is the chief section for the growing of wheat. Wheat is exported, while rye is largely used for bread for home consumption. The soil of Russia is especially suited to the growing of sugar-beets. In 1913 over one million acres of land were devoted to this crop, but reports since the revolution of 1917 indicate that this has been reduced twenty-five per cent.

Minerals. Next to the United States and Mexico, Russia is the greatest producer of petroleum. Most of the supply is found in the region of Baku on the Caspian Sea. Outside of this region, petroleum has been found in small quantities in the Urals and in Turkestan. Russia is also rich in many other minerals, especially platinum, gold, coal, and salt.

Commerce and Industry. Russia has developed very slowly and, because of political reasons, is still in a chaotic condition as far as trade and commerce are concerned. Much of this lack of development may also be ascribed to its geography. Russia has no deep seaport that is ice free. The really great river, the Volga, loses its commercial importance due to the fact that it flows into the Caspian Sea. Most of the other rivers are ice bound for many months of the year. Its principal seaports are Archangel on the White Sea and Leningrad on the Baltic Sea.

From the commercial viewpoint, Russia has been chiefly important as a producer of foodstuffs and raw materials. The American manufacturer has found this a good field for selling special machinery like mowers, reapers, and binders.

TEXT QUESTIONS

1. What countries are included in Scandinavia?
2. What minerals are to be found in Norway and Sweden?
3. What is the chief industry of Finland?
4. Why is Switzerland called the "playground of Europe?"
5. Name the chief products of Czecho-Slovakia.
6. Name and locate the chief industrial centers of Poland.
7. What three countries are in the Balkan Peninsula?
8. Why are the Balkan Peninsula countries so backward?

PROBLEMS AND PROJECTS

1. Racial hatreds are said to be insuperable barriers to the development of commerce in Europe. Show how the topography of Europe is a partial cause of these hatreds.
2. On an outline map of Europe draw a line paralleling the coast at a point about five hundred miles from the coast. Approximately how much of Europe is more than five hundred miles from the sea? How does this influence commerce?
3. Within a radius of 300 miles from Paris, there are more cities of over 100,000 than in any other similar area in the world. Why? How many are there? Compare the number with that of similar cities within a radius of 300 miles from New York City.
4. Write a report on Germany as an industrial and commercial country touching on the following points: (a) how natural advantages have been utilized, (b) how natural hindrances have been overcome, (c) five leading industries.

TOPICS

1. "Trade follows the flag."
2. Tariff policies of Great Britain, France and United States.
3. Advantages of the League of Nations.
4. Steel making in Spain.
5. Unemployment in England.

FOR CLASS DISCUSSION

1. English will become the universal language of business.
2. Commercial relations with Russia should be established by all the European countries and the United States.
3. One nation should control the Danube River.
4. The development of hydro-electric power will make Norway a leading manufacturing country.

CHAPTER XXVI

ASIA

In General. Asia is not only the largest continent in the world, but in many respects it is the grandest and most interesting of the continents of the world. Here we find the oldest nations, the highest tableland and mountains, and the least and most densely populated sections. Its commercial and industrial backwardness is in a large measure due to its topography. A large part of this continent is practically inaccessible.

The east-west trend of the mountains causes great differences in climate between the northern and southern regions. The great, open, high plains which are an extension of the fertile European plain are largely a desert, owing to the fact that the rains have become exhausted in their travels from the Atlantic coast. Civilization never went forward here in the same way it did in Europe, except in sections where navigable rivers made trade possible, such as the Tigris and Euphrates valleys and the river valleys of China and India. In considering the commerce and trade of modern Asia, we shall discuss in a general way only four regions, namely, western Asia, China, Japan, and India.

WESTERN ASIA

In General. The chief characteristic of much of western Asia is its great inland drainage basins of the Caspian, Aral, and Dead Seas. Here also we find the semi-arid regions of western Turkestan, Turkey, Palestine, Arabia, Hejaz, Oran, and Mesopotamia.

During the Middle Ages, western Asia was relatively richer and better developed than Europe. But the Ottoman Turk who came into control of much of this section in early modern times, has been a factor in making this region one of the most backward regions in the world. Since the Great War, much of this region is undergoing a change under the guidance of Great Britain and France. Even the new Turkish government is showing signs of progress, which may spell prosperity to that nation.

Products. Since time immemorial, this has been a region noted for its flocks of sheep and goats. The constant search for new pastures has kept its people a nomadic or wandering race. In Asia Minor is the home of the Angora goat, whose fleece, known as mohair, is longer and whiter than wool. The characteristic farm products of this region are cotton, oranges, olives, figs, and tobacco. Aside from cotton, silk, and dates, very little of the cultivated crops get into the trade with the outside world.

Manufacturing and Commerce. The manufacturing of this region is mostly of a simple type. Most of the articles are handmade and consist of rare silks, rugs, and copper goods. Cities, like Damascus, Beirut, and Smyrna, are the chief centers for most of the manufacturing of this region. The chief ports of commerce are Trebizond on the Black Sea and Smyrna on the Ægean Sea.

Minerals. This region is rich in mineral resources, which, like everything else, are very little developed. Oil is found in this region in considerable amount, which probably accounts for some of the international difficulties attending the question of the control of this region. The Dead Sea region is also rich in asphaltum, potash, and other salts of value.

INDIA

In General. When the European first came to India, he found a civilization older than his own. The country had a dense population, but owing to its inability to govern, the European who made government and trade a life work stepped in and ruled and developed this great country.

Climate and Soil. India has every type of climate within its borders. While it is largely tropical along the coast and in the great river valleys, yet, in the higher reaches of the Himalayas, is found the land of perpetual snow. This country is in the path of the trade winds and receives an abundance of rain. The country has a very fertile plain in the north, while the peninsula in the south is mountainous and rugged.

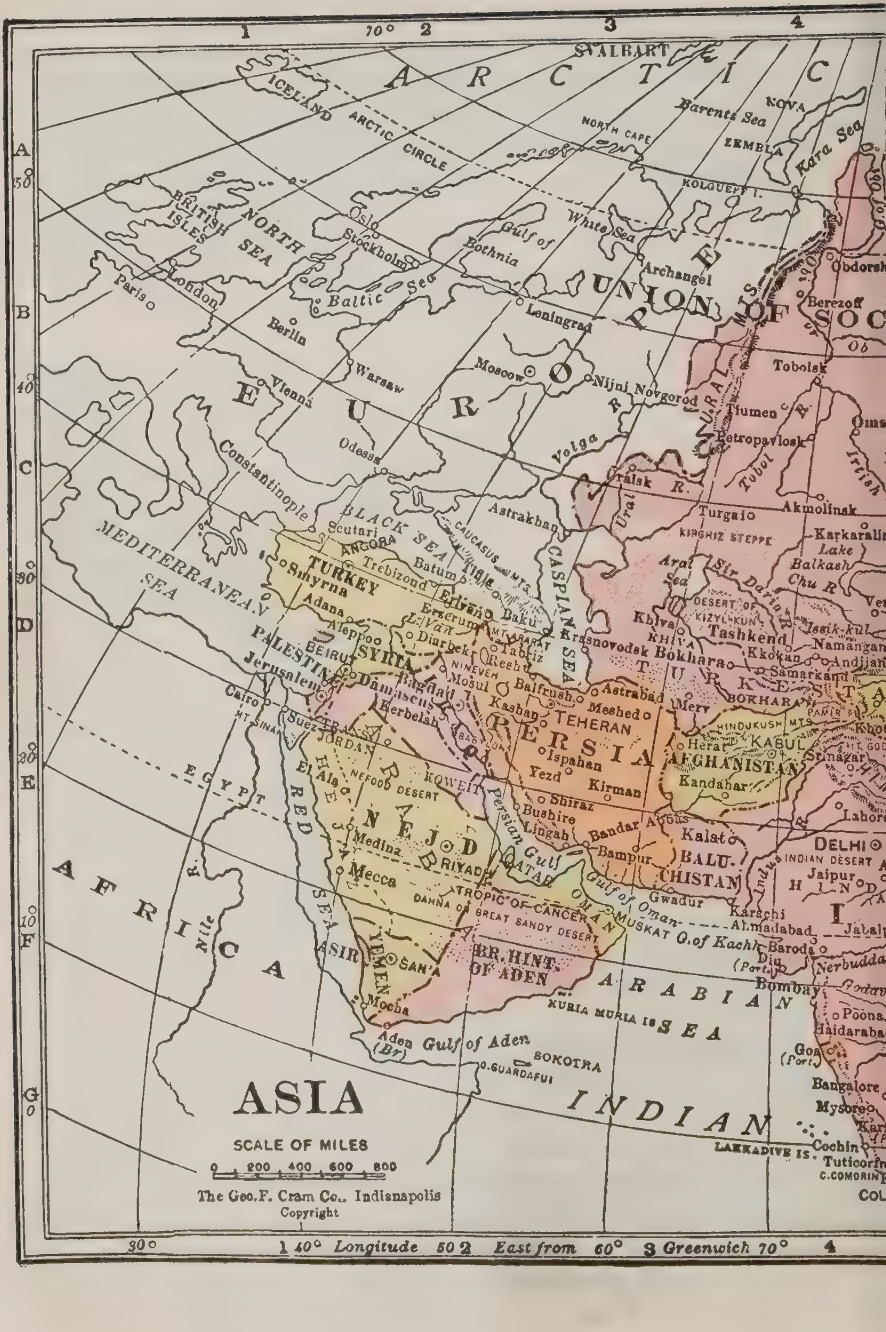
Products. Tropical fruits, notably the cocoanut and the date palm, are the characteristic products of India. Rice, cotton, tea, and cereals are important cultivated crops. In the southern tip of the peninsula and in the island of Ceylon grow many spices like cinnamon, pepper, ginger, and nutmeg.

Cattle raising for beef has never played a large part in the agriculture of India, owing to the religious veneration for all animals.

Manufacture and Commerce. As in all Asiatic countries, the manufactures of India are largely of the simple type, handmade, and consisting of fine metal work and ivory. Manufacturing, on the quantity basis, has made slow progress here, hence the lack of machinery. Here, too, is an abundance of cheap labor and raw materials, but standards of living are low and there is no stimulus for different life conditions. Here is a great potential market that some day will awaken and will either have to make its own articles or buy them elsewhere.

Transportation and Cities. In the matter of waterways, India is well supplied. The Ganges, Brahmaputra, and Irawadi Rivers are excellent natural highways, navigable for considerable distances. Railroads are relatively good. Probably India is as well supplied with railways as any other country in Asia, except Japan. Harbors are few, the best being the harbor of Bombay.

Commercial centers of importance are Calcutta, Madras, Colombo and Goa.


ASIA
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BRITISH ISLES
NORTH SEA
Oslo
Stockholm
Gulf of Bothnia
Baltic Sea
London
Paris
Berlin
Leningrad
UNION OF SOC
Obdorsk
Berezoff
Ob
Tobolsk
Tiumen
Petropavlosk
Omsk
Tobol
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URAL MTS.
Warsaw
Vienna
Moscow
Nijni Novgorod
Volga
Odessa
Uralsk
Ural R.
Akmolinsk
Karkaralinsk
Turgaio
KIRGHIZ STEPPE
Lake Balkash
Chu R.
Aral Sea
Sir Daria R.
Constantinople
BLACK SEA
Astrakhan
CAUCASUS MTS.
CASPIAN SEA
MEDITERRANEAN SEA
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ANGORA
TURKEY
Smyrna
Trebizond
Batum
Tiflis
Erivan
Baku
Adana
Erzerum
L. Van
MT. ARARAT
Tabriz
Krasnovodsk
Khiva
KHIVA
DESERT OF KIZYL-KUN
Tashkend
Issik-kul
Namangan
Andijan
Kokand
Bokhara
Samarkand
BOKHARA
TURKESTAN
Aleppo
Diarbekr
SYRIA
BEIRUT
PALESTINE
Jerusalem
Damascus
NINEVEH
Mosul
Resht
Balfrush
Astrabad
Meshed
Merv
Bagdad
Kerbelah
BABYLON
Kashan
TEHERAN
PERSIA
Ispahan
Yezd
Kirman
Herat
HINDUKUSH MTS.
PAMIR
KABUL
AFGHANISTAN
Kandahar
Srinagar
Lahore
Cairo
MT. SINAI
Suez
TRANS-JORDAN
El Ala
NEFOOD DESERT
KOWEIT
Persian Gulf
Shiraz
Bushire
Lingah
Bandar Abbas
Bampur
Kalat
BALUCHISTAN
Gwadur
Karachi
Indus R.
DELHI
INDIAN DESERT
Jaipur
HINDUSTAN
EGYPT
HEJAZ
ARABIA
NEJD
Medina
RIYADH
QATAR
Mecca
TROPIC OF CANCER
DAHNA OR GREAT SANDY DESERT
OMAN
MUSKAT
Gulf of Oman
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Diu (Port.)
Jabalpur
Nerbudda
Bombay
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Gulf of Aden
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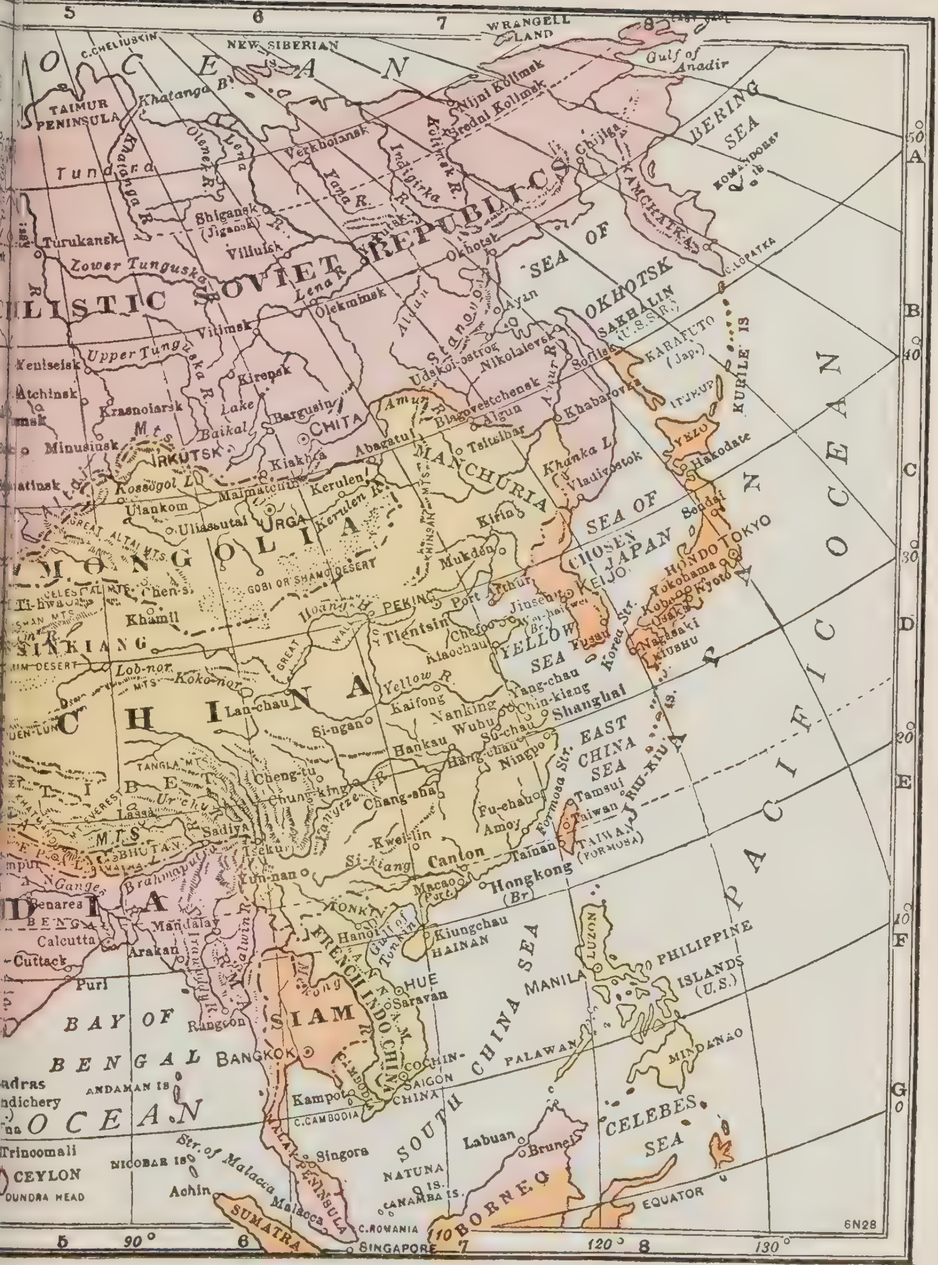
ARABIAN SEA
SOKOTRA
C. GUARDAFUI
INDIAN


O C E A N
C. CHELIUSKIN
NEW SIBERIAN IS.
WRANGELL LAND
Gulf of Anadir
TAIMUR PENINSULA
Khatanga B.
Nijni Kolimsk
Sredni Kolimsk
Kolimsk R.
BERING SEA
KOMANDORSKI IS.
Tundra
Khatanga R.
Olenek R.
Lena R.
Verkhoiansk
Yana R.
Indigirka R.
Chijiga
KAMCHATKA
Shigansk (Jigansk)
Villuisk
Turukansk
Lower Tunguska R.
Yakutsk
Okhotsk
C. LOPATKA
SEA OF OKHOTSK
SOCIALISTIC SOVIET REPUBLICS
Olekminsk
Aldan R.
Ayan
Stanovoi Mts.
Vitimsk
Yeniseisk
Upper Tunguska R.
Kirensk
Udskoi-ostrog
Nikolaievsk
SAKHALIN (U.S.S.R.)
Sofiisk
KARAFUTO (Jap.)
KURILE IS.
ITURUP
Atchinsk
Krasnoiarsk
Lake Baikal
Bargusin
CHITA
Amur R.
Blagovestchensk
Aigun
Khabarovsk
YEZO
Hakodate
Minusinsk
Sayan Mts.
IRKUTSK
Kiakhta
Abagatui
Tsitsihar
MANCHURIA
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Vladivostok
Kossogol L.
Maimatchin
Kerulen
Kerulen R.
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Uliassutai
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KHINGAN MTS.
Kirin
SEA OF JAPAN
Sendai
GREAT ALTAI MTS.
MONGOLIA
GOBI OR SHAMO DESERT
Mukden
CHOSEN
KEIJO
HONDO
TOKYO
Yokohama
Kyoto
Kobe
Osaka
CELESTIAL MTS.
Ti-hwa
Chen-si
Khamil
Hoang-ho
PEKING
Port Arthur
Jinsen
Wei-hai-wei (Br.)
Fusan
Korea Str.
Nagasaki
KIUSHU
SINKIANG
Tientsin
Chefoo
Kiaochau
YELLOW SEA
GREAT WALL
Lob-nor
Koko-nor
Yellow R.
Yang-chau
Chin-kiang
Shanghai
CHINA
Lan-chau
Kaifong
Nanking
Wuhu
Su-chau
Hang-chau
Ningpo
EAST CHINA SEA
RIU-KIU IS.
PACIFIC OCEAN
KUEN-LUN
Si-ngan
Hankau
TANGLA MTS.
TIBET
Cheng-tu
Chung-king
Yangtze R.
Chang-sha
Fu-chau
Amoy
Formosa Str.
Tamsui
Taiwan
TAIWAN (FORMOSA)
Tainan
Lassa
MT. EVEREST
HIMALAYA MTS.
BHUTAN
Sadiya
Tseku
Kwei-lin
Si-kiang
Canton
Hongkong (Br.)
Macao (Port.)
NEPAL
Brahmaputra R.
Ganges
Yun-nan
Benares
INDIA
BENGAL
TONKIN
Hanoi
Gulf of Tonkin
Kiungchau
HAINAN
LUZON
PHILIPPINE ISLANDS (U.S.)
Mandalay
Calcutta
Cuttack
Arakan
Salwin R.
Irawadi R.
BURMA
FRENCH INDO-CHINA
HUE
Saravan
Mekong
SOUTH CHINA SEA
MANILA
Puri
BAY OF BENGAL
Rangoon
SIAM
BANGKOK
CAMBODIA
ANNAM
COCHIN-CHINA
SAIGON
PALAWAN
MINDANAO
Madras
Pondichery
ANDAMAN IS.
Kampot
C. CAMBODIA
INDIAN OCEAN
CELEBES SEA
Trinoomali
CEYLON
DONDRA HEAD
NICOBAR IS.
Str. of Malacca
MALAY PENINSULA
Singora
NATUNA IS.
Labuan
Brunei
Achin
Malacca
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CHINA

In General. The country of China includes the provinces of Mongolia, Manchuria, Kashgar, and Tibet. Here is a nation a third larger than continental United States with a population of over 400,000,000, living under conditions which would be impossible for any other race. This nation extends from the latitude of Jamaica to that of Labrador and has a corresponding variety of climate.

The most prosperous part of China is the eastern section, where the valleys open toward the ocean, allowing the rain-bearing winds to go into the interior. This section is made up largely of three great river valleys: the Hwangho, the Yangtze-kiang and the Sinkiang. These river valleys contain very fertile soil, although in the Hwangho valley there is much loose soil which is destroyed by floods and earthquakes, thus making agriculture a hazardous undertaking. This is particularly true of the upper regions of this river.

Agriculture. Every inch of available land is stripped of forests in order to prepare it for cultivation. The fact that one-quarter of the people in the world live in this country makes it imperative that every possible food producing land be made to yield foodstuffs. The best agricultural region is in southern China. Here rice is the most important food crop. The Sinkiang valley is the home of sugar and cotton, for the ancient traders had heard of "a reed that bore wool without sheep, and honey without bees" in this far away land. The principal hill products are silk and tea, the two commodities which originally opened China to foreign commerce.

In northern China and Manchuria, the principal crops are beans and wheat. The city of Newchwang on the Gulf of Liaotung is the greatest bean market in the world. Manchuria, together with the province of Mongolia, rivals the United States and Canada in the amount of land adapted to the growing of spring wheat. Much of this region is pasture land, where large herds of cattle are kept. Here, as in Canada and the Argentine is a future granary for the world. Aside from poultry and swine, there are few domestic animals in China. This is largely due to an overcrowded condition and lack of food. Farther west in central Asia, however, one finds sheep, goats, horses, and camels.

Minerals. It is believed that some of the greatest fields of coal in the world may be found in China. Already, vast deposits have been discovered in the province of Shansi. It is claimed that this region contains twenty times as much anthracite coal land as the United States. Other valuable anthracite deposits are known to exist in the province of Hunan. Bituminous coal is found in many provinces, also in Manchuria. These coal fields lie mostly in horizontal seams, making it possible to mine the coal under more favorable circumstances than in the United States. These fields are conveniently located near iron as in the Shantung Peninsula.

(Underwood & Underwood, N. Y.)

FIG. 200. A TYPICAL RIVER SCENE, CANTON

Other minerals of considerable quantities and value are to be found in the southwestern province of China on the plateau of Yunnan. Here silver, lead, tin, gold, and sulphur are mined. These same minerals also are found in the Shantung Peninsula and in the Shansi Mountains.

Manufactures. The characteristic type of Chinese manufactures is of the handwork variety. The Chinese have been very slow to take on new ideas. Religion has had a most marked effect on the commercial and industrial development of this race. The old Confucian motto, "Walk in trodden paths," has kept this race from trying new ideas in all phases of life. Modern machinery, however, has been introduced, especially in the cotton mills. The making of India ink, the carving of wood and ivory, the manufacture of paper, matting bamboo, fans, and fireworks are the chief industries of China.

Transportation. Another great handicap to the development of China is the lack of transportation and communication facilities. Most of the transportation is carried on by river boats. The great rivers afford excellent facilities, but can only reach the section contiguous to them. On land, most of the freight is carried by wheelbarrow. This mode of transportation is due mainly to the lack of good roads. For some reason, it never seems to have occurred to the Chinese to build or repair their roadways, and, hence, most of the so-called roads are nothing more than paths. A great deal of carrying is done by means of porters. In Manchuria, some animal power is used, especially the horse and camel. The caravan trade across Mongolia to the west is carried by camels. Most of the tea for Europe goes this way, as it is said that ocean travelling injures its flavor to some extent.

There are, however, a few railroads in China, built by foreign capital and builders. A branch of the Siberian railway crosses Manchuria to Vladivostok and Port Arthur. Another very important line commercially is the Pekin-Hankow line, which will be extended to Canton, forming a great trunk line running north and south through a very rich and populous country. Still another trunk line joins Tientsin and Nanking with Shanghai. There is also a line (the French Indo-China) built by the French, which connects the copper and iron fields of Yunnan with the sea.

Cities. The cities of first importance are either river ports or sea ports. Some of the most important are Canton, Shanghai, Hankow, Tientsin, and Pekin. Canton is a city of some 900,000 inhabitants. It is the chief silk market of China. Shanghai, at the mouth of the Yangtze River, is called the New York of China because of its great hinterland. This city is becoming a great distributor of American goods, as it is here that most American imports and exports are handled.

The largest city in China is the city of Hankow, on the Yangtze-kiang River, located some 680 miles from the sea. It is a great tea market and is the meeting point of many trade routes radiating throughout central China. In the north, commerce centers around the gulf of Chihli. Tientsin, the river port of Pekin, is second only to Shanghai as a center of commerce. Pekin commands the rail and caravan routes through Mongolia to Siberia and Europe.

Commerce. The principal exports of China are silk, tea, cotton, beans, and hides. The bulk of trade is with Great Britain and the British possessions. American development has been hindered here for about the same reasons that it has been hindered in South America. There is a noticeable improvement, however, and there is every evidence that trade between the United States and China is bound to increase very materially within the next decade. China is the greatest potential market in the world today. Some day it will become a great consumer of manufactured goods, and the United States, nearer to it than Europe by ocean transportation, has a vital interest there.

JAPAN

In General. This country has been likened to Great Britain. Here is an island kingdom, off a great continent, and, like Great Britain, a great commercial nation. The Japanese Empire consists of a string of islands extending along the coast of Asia from the Peninsula of Kamchatka to the Philippine Islands. These islands are, for the most part, mountainous and only a small part are fit for cultivation. Of the four main islands of the empire, not more than 16 per cent of the area is fit for the plow; hence, the geography of the nation is such as to compel the inhabitants to turn to trade and commerce.

Japan still has considerable forest lands. The most prevalent are the cypress, fir, and cedar. In the island of Formosa grows the famous camphor tree, which is of great commercial value. Oak forests are found on the northern island of Yezo. Another tree of commercial importance is the lacquer tree, utilized largely for the preparation of varnish. A characteristic tree of Japan is the bamboo which has innumerable uses.

Agriculture. Because of the crowded condition of the island, and the small amount of arable land, the farms of Japan are very small. Very few are over two acres, which means that every inch of soil must be cultivated very intensively. This also has the effect of lessening the number of cattle and livestock, for there is no pasturage sufficient to support them; hence, meat and dairy products enter very little into the lives of the Japanese people. The principal agricultural crops are rice, silk, and tea.

Minerals. Coal deposits of considerable extent abound throughout the empire. The island of Yezo is said to contain two-thirds as much coal land as Great Britain. Other minerals are silver, lead, petroleum, and sulphur.

Manufactures. Like the Chinese, the Japanese turn largely to handcrafts, and the principal products are fine paper, glass, oil cloth, matting, porcelain, and metal work. Other notable industries are matches, cotton, silk, and lacquer ware. Textiles are perhaps the most important of the modern industries and form about twenty per cent of Japan's exports. The modern industrial center is now at Osaka on the island of Honshu. This city has the advantage of being located near coal and water transportation. In this section is found the bulk of the population of the empire.

Transportation. The railways of Japan are relatively numerous, though they are necessarily short. Lines traverse the large island of Honshu as well as the islands of Kiushu and Formosa. These roads have done much to develop commerce and trade, enabling inland cities and towns to turn to manufacturing by making them accessible to seaports.

Cities. Some of the important cities of Japan are Yokohama, the commercial port facing the east; Nagasaki, where shipbuilding and iron works abound; Osaka, the center for textiles; and Tokio, the capital.

The crowded condition of the Japanese Empire, the small amount of land fit for the production of food, the growth of manufactures in that country, all are factors which are causing the Japanese people to look elsewhere for lands to cultivate and for markets to distribute their commodities. These factors go far toward explaining the desire of the Japanese to control Korea, eastern Siberia, and Mongolia. These provinces would greatly increase the food supply of the island kingdom. Japan is also fast becoming a competitor with the great nations for the markets of China.

TEXT QUESTIONS

1. What is the chief topographical feature of western Asia?
2. What are the chief products of manufacture and commerce in this region?
3. Name three large rivers in China.
4. Name the principal articles of export in China.
5. How may Japan be compared with the British Isles?
6. What advantages has Japan for developing manufactures?
7. What commodity of great commercial value is found in the island of Formosa?

PROBLEMS AND PROJECTS

1 Summarize the geographic advantages and disadvantages of the Asiatic continent.

2. Contrast India with Mexico accounting for the differences in (a) chief products, (b) imports, (c) exports, (d) countries with which they trade.
3. Asia is more important to the United States as a market for goods and foreign trade than South America. Why is this so? Look up statistics of foreign trade of the United States with both continents.
4. Why has Japan developed into a first-class nation?

TOPICS

1. Cotton production in India.
2. Compare Japan and Great Britain, commercially and industrially.
3. River trade of China.
4. Tea growing, harvesting and marketing.
5. Influence of Buddhism and Brahmanism on the commerce and industry of China.

FOR CLASS DISCUSSION

1. The yellow race will some day be the leading industrial and commercial race.
2. China is the best market in the world for American cotton goods.
3. India will develop machine manufacturing on a large scale.

CHAPTER XXVII

AUSTRALASIA

East Indies. The islands stretching from the Malay Peninsula south and east toward Australia and New Zealand are known as the East Indies. These islands are all tropical and populated largely by the Malay races. The islands are well watered and abundantly fertile, but the climatic and racial handicaps have prevented a full development of their resources.

Java is, by far, the most important of the islands in the East Indian group. Controlled by the Dutch, this tropical island has been a source of much wealth to the mother country, Holland. Java is noted for its crops of tea, cinchona, cane-sugar, and spices. Of the other islands, Sumatra is noted for tobacco; the Moluccas for spices; Borneo for gutta percha; and the Malay settlements for rubber and tin. Singapore is the chief port of this region.

Malay Peninsula. This strip of land, extending south from Burma and Siam along the island of Sumatra, is one of the most valuable regions in this part of the world. This peninsula, as well as the region north and in the islands, is famous for two important commercial products, namely, tin and rubber. The most productive tin mines in the world are in the southern end of the peninsula near the city of Singapore, where tin is smelted.

Because of its great demand, rubber has become one of the world's most important commercial products. A few years ago, rubber was obtained from the wild trees in the Brazilian and Congo jungles. Each year, the rubber gatherers were compelled to go farther and farther inland to secure rubber for the market, thus increasing the cost. In the Malay Peninsula, the climate and soil are very favorable for the growth of the rubber tree, and huge plantations of cultivated trees are planted, cared for, and tapped scientifically. This region is now furnishing over 90 per cent of the world's supply of rubber.

AUSTRALIA

In General. Far from the common trade routes is the great island continent of Australia. This continent is nearly as large as the United States, it being nearly 2,100 miles long and 1,000 miles wide. It has a very uniform seacoast, which is fringed for the most part by high mountains or hills which prevent easy access to the interior. The chief mountains border the coast on the east and southeast, condensing the moisture on the eastern slope and making three-fourths of the island too dry for agriculture.

Agriculture. Australia is pastoral rather than agricultural. It has long been known as a great sheep growing country and is now first among the nations of the world as a producer of wool. Sheep raising is most common in the state of New South Wales, while horses, beef, and dairy cattle are raised considerably in Queensland and Victoria. The sparse population of the country and a good supply of pasturage are factors which are prominent in making pastoral pursuits among the chief activities of the people of Australia.

Australia, as an agricultural country, is seriously handicapped on account of its periodic droughts. Only in the eastern and southern sections do we find agriculture carried on to any great extent. Even here it is sometimes too dry for profitable farming. For this reason, Australia is not a reliable exporter of grain. Wheat is the leading agricultural crop, and though not as much may be harvested in the whole country as in one of the states in the United States, yet Australia is a large exporter, largely on account of the small population at home.

Minerals. In mineral supplies, Australia ranks high. Her gold output for the year 1927 was over $3,000,000,000. Next

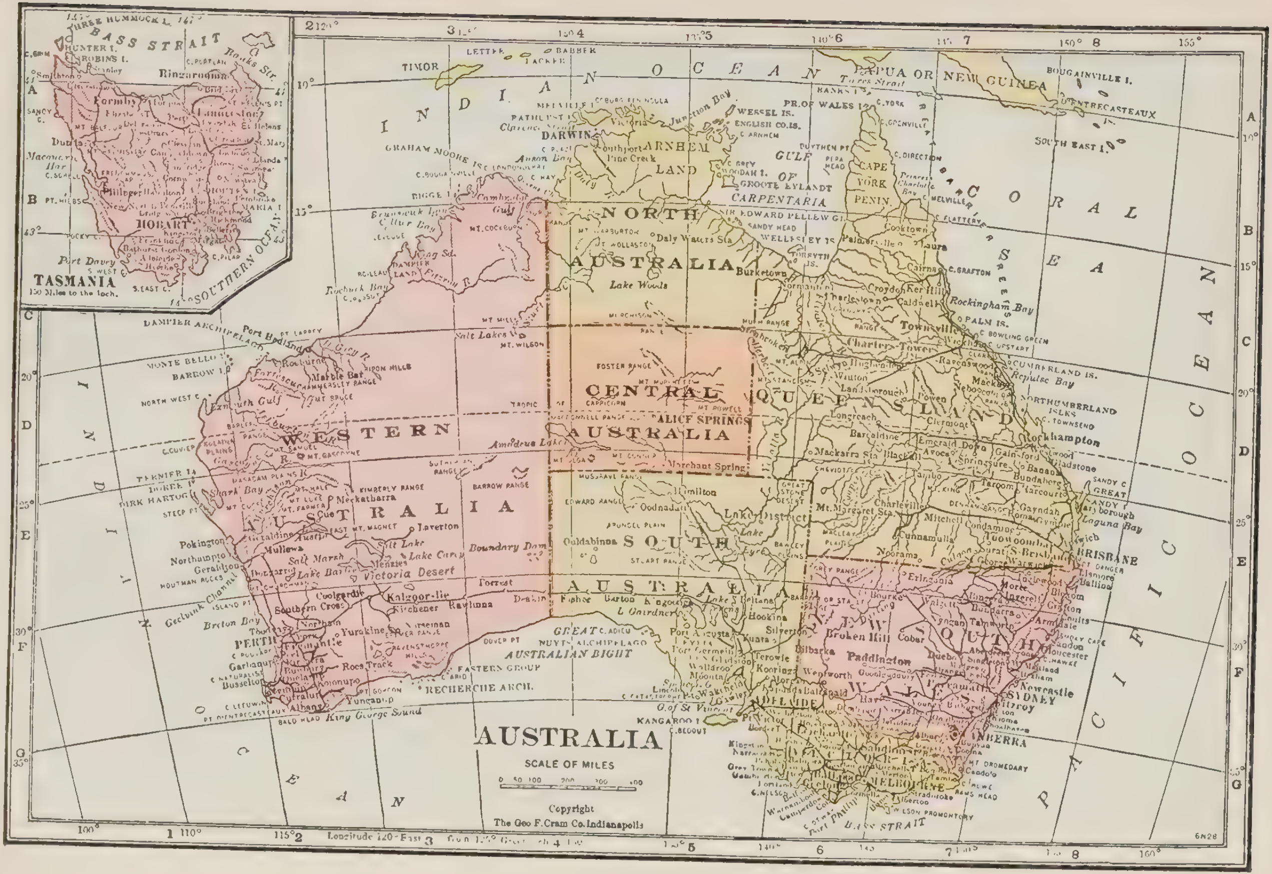
AUSTRALIA
SCALE OF MILES
Copyright
The Geo F. Cram Co. Indianapolis
INDIAN OCEAN
CORAL SEA
PACIFIC OCEAN
OCEAN
PAPUA OR NEW GUINEA
TIMOR
NORTH AUSTRALIA
CENTRAL AUSTRALIA
WESTERN AUSTRALIA
SOUTH AUSTRALIA
QUEENSLAND
NEW SOUTH WALES
VICTORIA
TASMANIA
150 Miles to the Inch.
BASS STRAIT
SOUTHERN OCEAN
GULF OF CARPENTARIA
ARNHEM LAND
CAPE YORK PENIN.
GREAT AUSTRALIAN BIGHT
DARWIN
ALICE SPRINGS
BRISBANE
SYDNEY
MELBOURNE
ADELAIDE
PERTH
HOBART
CANBERRA
Rockhampton
Newcastle
Broken Hill
Kalgoorlie
Coolgardie
Victoria Desert
Lake Eyre
Torres Strait
Longitude 120 East from Greenwich
6N28

FIG. 201

to Africa and the United States, Australia ranks third as a producer of this metal. The mines in Victoria have shown a decline in production in the last decade, but the mines of the extreme western area have more than held their own. Tin is found in the north and east sections, and copper is found here in abundance. Australia produces coal for export trade, the mines in New South Wales exporting coal across the Pacific to Chile.

Manufactures. From the standpoint of manufacturing, Australia is interested mostly in those commodities connected with the raw materials that are close at hand. For this reason, most of the industries are those connected with meat packing, wool, and leather. The small population of this country does not furnish a supply of labor that is adequate for any large amount of manufacturing.

Commerce. Commercially this region is very backward. One of the factors we have already named, the small population, has had much to do with retarding commercial progress. Another factor is the lack of adequate transportation facilities. Such railroads as there are, are made up of several different gauges; continuous transportation is, therefore, very difficult. The south and east are the only sections connected by rail. There is no good water transportation. No large rivers enter the sea, and even the Murray River which is navigable for a short distance is almost too dry at times.

Cities. The principal cities of Australia are Melbourne and Sydney. These two cities contain nearly a quarter of the population and are the chief commercial centers of the country. Melbourne is located in the most fertile part of Australia in the midst of grain, cattle, and fruit farms. Sydney, the metropolis of the country, has the advantage of being located near coal fields and also being located on a most excellent natural harbor. Other cities of importance are Newcastle, a coal port, Brisbane, Adelaide and Port Darwin.

New Zealand. Geographically, New Zealand has a better location than Australia, because it is in the belt of heavier rainfall. The climate is temperate, being an ideal climate for the white race. The rainy climate makes this country an excellent pasturage ground and will support many sheep and cattle to the acre. The inhabitants are predominantly of English stock and are prosperous and energetic. They are mostly concerned with sheep raising. Meat packing, tanning of leather, and the manufacture of butter and cheese are the principal phases of manufacturing. Most of the trade is carried on with Great Britain and consists chiefly of frozen meat, wool, and dairy products.

TEXT QUESTIONS

1. Name two important products obtained from the Malay Peninsula region.
2. Compare the topography of Australia with that of the United States.
3. Why is sheep and dairy cattle raising more important in Australia and New Zealand than other types of agriculture?
4. Is Australia a reliable exporter of grain? Why?
5. What minerals are found in Australia?
6. What is the position of Australia as a producer of gold?
7. What are the main occupations of the people of New Zealand?

PROBLEMS AND PROJECTS

1. Why does so large a part of the population of Australia live in cities?
2. The per capita foreign commerce of New Zealand is relatively large. Why?
3. Why has Australia no large iron industry since she has both iron ore and coal?
4. Why is there so little immigration into Australia?
5. Why should the United States cultivate Australia as a market?

TOPICS

1. Wool production in New Zealand and Australia.
2. Rubber plantations of the Malay Peninsula.
3. The refrigerator ship.
4. The commercial value of the Dutch East Indies to Holland.
5. The importance of dairy industries in Australia and New Zealand.
6. Australia's and New Zealand's position as a market for United States goods.
7. The sugar industry in Australia.
8. The importance of the meat industry in New Zealand.

FOR CLASS DISCUSSION

1. New Zealand will develop a highly industrialized type of life in the future.
2. An obstacle to industrial development in Australia is her insistence on a "white Australia."
3. Irrigation of the arid and semi-arid parts of Australia is impractical.
4. Although Australia has both iron and coal there will never be a large iron industry in that continent.
5. Australia and New Zealand serve the needs of the British Isles better than any other of the British Dominions.
6. Java is the most prosperous island in the East Indies.
7. Singapore occupies the most strategic position of any city in the East Indies.

CHAPTER XXVIII

AFRICA

In General. Africa has long been called "the Dark Continent." While the northern part of this continent has been known since the earliest historical times, yet Africa today is a mysterious land, largely unknown and undeveloped.

Economically, Africa is the most backward continent in the world despite the fact that it is rich in minerals, valuable forest lands, and tropical fruits. A glance at a relief map of this continent will help to explain why Africa is behind in the economic progress of the continents. The disadvantages of the African continent may be summed up briefly as follows: (1) its location in the tropics, (2) an even, unbroken coast line, affording no good harbors, (3) its large rivers which are navigable for only a short distance from the seacoast on account of falls or cataracts, and (4) a savage race which makes up the greater proportion of its inhabitants.

Perhaps climate and race have been the greatest obstacles to African development. Nowhere do we find an energetic race, except possibly in the wild, high, mountainous region of Abyssinia and the southernmost end of the continent in British South Africa.

Northern Africa. The characteristic surface feature of this part of Africa is the desert. The great Sahara Desert stretches across the northern part of the continent from the Atlantic ocean to the Red Sea. Except for a few favored valleys in Morocco, a narrow strip along the Mediterranean Sea, and the valley of the Nile, the whole region is a dry barren waste.

Products. In Egypt the main crops are cotton, rice, sugar-cane, and wheat. Here grows the famous, long-fibered Egyptian cotton. Cotton is one of Egypt's chief products in foreign commerce. In Tripoli, Algeria, Tunis and Morocco, only a small portion of the land is adapted to farming and, because of the primitive methods in farming, production is very small, consisting mostly of cereals, olives, and tropical fruits.

Farther south among the oases of the desert, are found date palms and some excellent pasture lands for the flocks of sheep and herds of goats. Minerals such as copper, gold, iron, lead, and silver are found in the mountains of Morocco. The chief commercial centers of northern Africa are Alexandria, Cairo, and Port Said.

Equatorial Africa. Beginning with the grasslands of the Sudan, just south of the Sahara Desert, and stretching through the jungles of central Africa to the plains and grass lands near the Tropic of Capricorn, is the real Dark Continent. Here is found one of the most dense forests in the world. For the most part, the commercial importance of central Africa consists in its supply of tropical fruits and products. Chief among them may be mentioned ivory, palm nuts, cocoanuts, cacao, dyewoods, and rubber. The climate of this region is too enervating for agriculture to prosper, and the getting of a living is too easy to inspire much effort on the part of the inhabitants. With the exception of Liberia, this region is controlled and exploited by European nations.

South Africa. In the southern end of the continent, in the temperate regions, the white man can live and prosper. Here the soil and climate are well adapted to the white man's type of agriculture. Wheat, sugar-cane, and other crops are grown in abundance, and some are even exported. A unique and original phase of South African farming is that of ostrich farming.

Minerals. Perhaps the greatest attraction in South Africa for the white man is its wealth of gold and diamonds. South Africa is the chief gold producing region in the world, exporting nearly $200,000,000 worth annually.

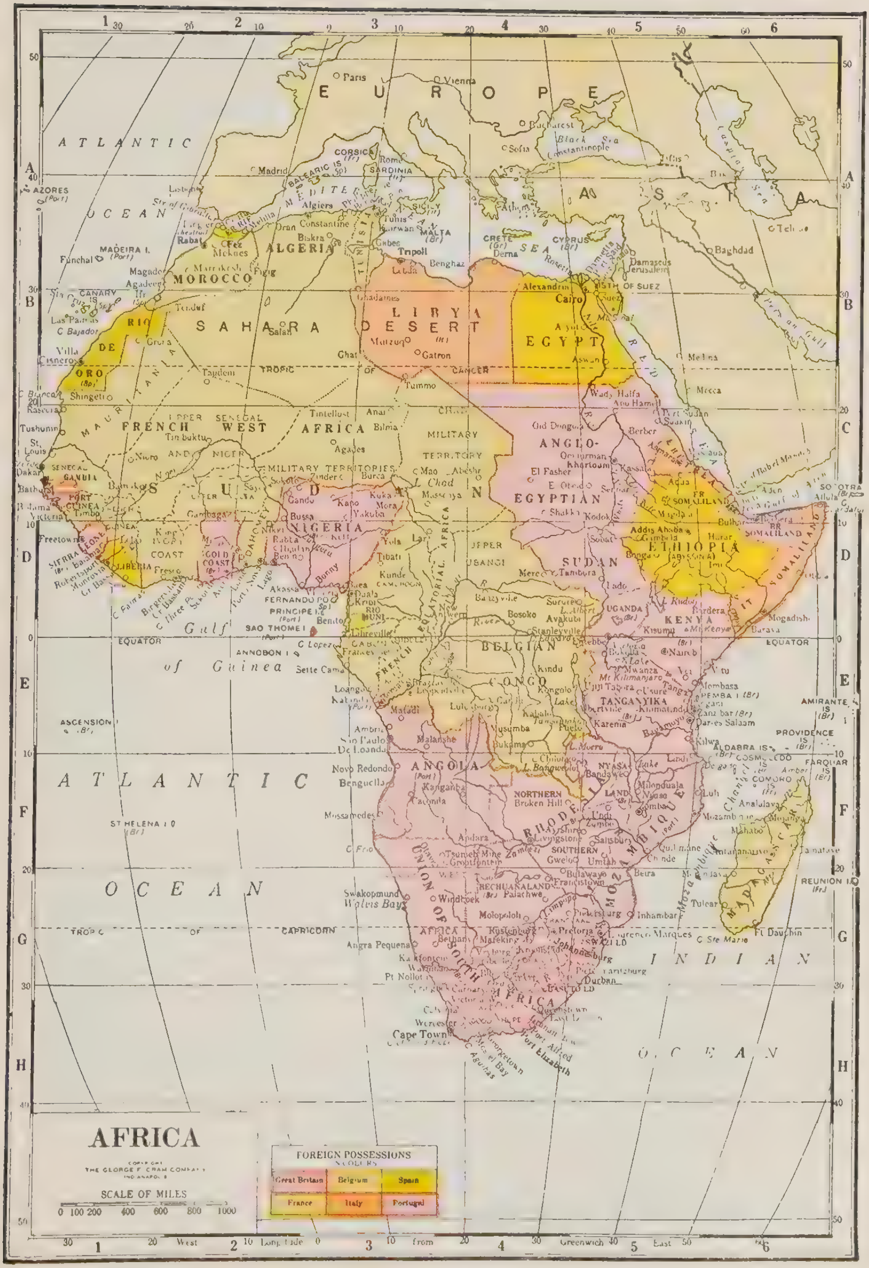
AFRICA
COPYRIGHT THE GEORGE F. CRAM COMPANY INDIANAPOLIS
SCALE OF MILES
0 100 200 400 600 800 1000
FOREIGN POSSESSIONS IN COLORS
Great Britain
Belgium
Spain
France
Italy
Portugal
E U R O P E
A S I A
A T L A N T I C O C E A N
I N D I A N O C E A N
Paris
Vienna
Madrid
Lisbon
Rome
Sofia
Bucharest
Constantinople
Black Sea
Caspian Sea
CORSICA (Fr)
SARDINIA (It)
BALEARIC IS. (Sp)
SICILY (It)
MALTA (Br)
CRETE (Gr)
CYPRUS (Br)
AZORES (Port)
MADEIRA I. (Port)
CANARY IS. (Sp)
Funchal
Las Palmas
Str. of Gibraltar
Rabat
Fez
Mekness
Marrakesh
Mogador
Agadeer
Ifni (Sp)
MOROCCO
Algiers
Oran
Constantine
Biskra
ALGERIA
Tunis
Kairwan
Gabes
TUNISIA
Tripoli
Libia
Benghazi
Derna
Alexandria
Cairo
Suez
ISTH. OF SUEZ
Damascus
Jerusalem
Baghdad
Tehran
Persian Gulf
Medina
Mecca
RED SEA
Tenduf
RIO DE ORO (Sp)
C. Bojador
Villa Cisneros
SAHARA
Salah
LIBYAN DESERT
Murzuq
Gatron
Ghat
Ghadames
EGYPT
Asyut
Aswan
TROPIC OF CANCER
Tummo
Taodeni
Shingetti
Wady Halfa
Abu Hamed
Port Sudan
Suakin
Berber
Khartoum
Omdurman
Old Dongola
ANGLO-EGYPTIAN SUDAN
El Fasher
El Obeid
Kassala
Massawa
ERITREA
Asmara
Aden
Gulf of Aden
Str. of Bab el Mandeb
SOCOTRA (Br)
Allula
C. Guardafui
FR. SOMALILAND
BR. SOMALILAND
Berbera
Bulhar
Harar
Addis Ababa
Gimbala
ETHIOPIA (ABYSSINIA)
ITALIAN SOMALILAND
Mogadishu
Brava
FRENCH WEST AFRICA
MAURITANIA
UPPER SENEGAL NIGER
Timbuktu
Niger
St. Louis
Dakar
SENEGAL
GAMBIA
Bathurst
PORT. GUINEA
Bolama
Timbo
FRENCH GUINEA
Freetown
SIERRA LEONE (Br)
Monrovia
Robertsport
LIBERIA
C. Palmas
IVORY COAST
GOLD COAST (Br)
Kumasi
Accra
DAHOMEY
TOGO
Lagos
Porto Novo
Abeokuta
NIGERIA
Kano
Sokoto
Zinder
Bussa
Yola
Gulf of Guinea
EQUATOR
FERNANDO PO (Sp)
PRINCIPE I. (Port)
SAO THOME I. (Port)
ANNOBON I. (Sp)
ASCENSION I. (Br)
ST HELENA I. (Br)
CAMEROON
Duala
RIO MUNI
Libreville
GABUN
C. Lopez
MILITARY TERRITORY
Agades
Bilma
Tibesti
Borku
Abeshr
L. Chad
FRENCH EQUATORIAL AFRICA
UPPER UBANGI
Bangi
Brazzaville
BELGIAN CONGO
Stanleyville
Bosoko
L. Albert
Kindu
Kasongo
L. Tanganyika
L. Mweru
L. Bangweulu
Elizabethville
UGANDA (Br)
Entebbe
L. Victoria
Kisumu
Nairobi
KENYA
Mt. Kenya
Mt. Kilimanjaro
Mombasa
PEMBA I. (Br)
ZANZIBAR (Br)
Dar es Salaam
TANGANYIKA
Tabora
Ujiji
Kilwa
Lindi
AMIRANTE IS. (Br)
PROVIDENCE IS. (Br)
ALDABRA IS. (Br)
COSMOLEDO IS.
COMORO IS. (Fr)
FARQUHAR IS. (Br)
Loango
Matadi
Boma
Sao Paulo de Loanda
Malanshe
Novo Redondo
Benguella
ANGOLA (Port)
Mossamedes
C. Frio
NORTHERN RHODESIA
Broken Hill
Livingstone
NYASALAND (Br)
L. Nyasa
Zomba
Blantyre
MOZAMBIQUE (Port)
Quelimane
Beira
Inhambane
Mozambique Channel
MADAGASCAR (Fr)
Majunga
Tananarive
Ft. Dauphin
C. Ste Marie
REUNION I. (Fr)
SOUTHERN RHODESIA
Salisbury
Bulawayo
Gwelo
Umtali
Zambezi
Limpopo
BECHUANALAND (Br)
Palachwe
Francistown
Molopolole
Mafeking
Kimberley
Windhoek
SOUTH WEST AFRICA
Swakopmund
Walvis Bay
Angra Pequena
Pretoria
Johannesburg
SWAZILAND
Lourenco Marques
Bloemfontein
Pietermaritzburg
Durban
BASUTOLAND
UNION OF SOUTH AFRICA
Pt. Nolloth
Cape Town
Worcester
Port Elizabeth
Port Alfred
East London
Mossel Bay
C. Agulhas
Georgetown
TROPIC OF CAPRICORN
West Longitude 0 from Greenwich East
A
B
C
D
E
F
G
H
1
2
3
4
5
6
10
20
30
40
50

FIG. 202

The diamonds of this same region also form a most important and profitable income. The diamond mines are found mostly along the Vaal and Orange Rivers. This region furnishes nearly the entire supply of these precious stones for the markets of the world.

Commerce. The chief commercial centers of this region are Kimberly, Johannesburg, and Capetown.

The whole continent of Africa will undoubtedly play a greater part in the commerce of the world in the future. There are untold riches in minerals, forest supplies, water-power, and tropical fruits. The great need is inland transportation. This need is being slowly satisfied, and railroads are penetrating the jungle to connect the Mediterranean with the Cape of Good Hope.

TEXT QUESTIONS

1. Why is Africa called the "Dark Continent"?
2. Summarize the geographic advantages and disadvantages of Africa.

[illegible] rice sugar Cane

3. What are the chief products of northern Africa?
4. Name the chief products of equatorial Africa.
5. Name the independent countries of Africa.

PROBLEMS AND PROJECTS

1. Why is South Africa the only region in Africa where the white race has settled in great numbers?
2. What animal industry have the South Africans developed? In what sections of our country is the same industry developed to a limited extent?
3. Why are the rivers of Africa of so relatively little commercial importance?

TOPICS

1. Transportation possibilities across the Sahara Desert
2. The importance of the Suez Canal.
3. The diamond mines of South Africa.

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men hats
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